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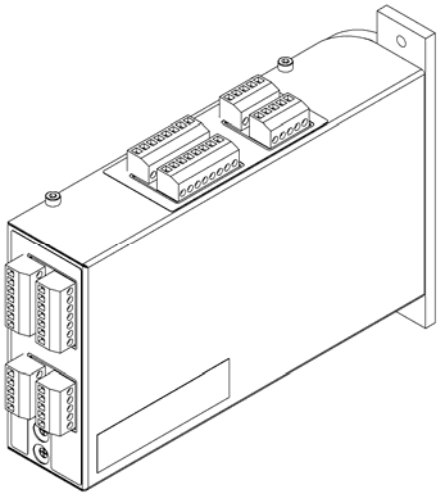


OPERATING INSTRUCTIONS

EC MOTOR CONTROLLER (ECMR)

Electrical and Software Documentation

BA-100078
Starting from serial number 429991
English edition 02/2008

Contents

1 Important information

1.1 Introduction

These Operating Instructions cover among other things the functional scope, technical data, load limits, installation and spare parts of the EC Motor Controller.

These Operating Instructions are part of the overall documentation of the electrical components. The overall documentation consists of the following documents:

Operating Instructions	Device
BA-100078	ECMR
BA-100058	KUSE
BA-100074	DAE
BA-100069	GPE
BA-100070	GWE

- **This document must be read before commissioning.** Incorrect handling of the EC Motor Controller (ECMR) may lead to injury to persons, material damage and loss of the right to warranty claims. All technical data and specifications concerning connection conditions must be strictly observed.

- Basic knowledge of the Windows operating system and operation of a personal computer are required. Information about safety, installation and commissioning must be strictly observed.

1.2 EU declaration of conformity (pursuant to MRL Appendix II A)

Directives and standards taken into account:
Machinery Directives 89/392/EEC, 91/368/EEC

Manufacturer:
Montech AG, Gewerbestrasse 12 CH-4552 Derendingen, Switzerland
Tel. +41 32 681 55 00, Fax +41 32 682 19 77

1.3 Product description

1.3.1 ECMR controller

The ECMR can be used for torque control or position control. It depends on the connected device whether the ECMR works as a torque or position controller:

KUSE DAE	→	Position control
GPE GWE	→	Torque control

Position control
The motion tasks stored in the EEPROM of the ECMR can be selected and started via the digital inputs. A digital output reports the arrival at the target position. All key functions of the position controller can be initiated by the control system of any manufacturer.

Torque control
The movement direction is selected via a digital input. The device then travels to the end position. The desired "Current" torque and maximum travel "Speed" can be defined by potentiometers. Further, it is possible to select from three stored torques and three stored maximum travel speeds via digital inputs.

1.3.2 "Start-up ECMR" commissioning software

The device connected to the ECMR must be adjusted to the conditions of the application. Setting the parameters is not performed on the ECMR itself, but rather on a personal computer (PC) using the "Start-up ECMR" commissioning software. The PC is connected to the ECMR with a null modem line (serial). The commissioning software establishes communication between PC and ECMR.

With a minimum of effort parameters can be changed, sent to the ECMR and the changes applied in the connected device.

Actual values are periodically read out from the ECMR and displayed in the status line of the commissioning software.

Configurations and motion task tables can be saved (archived) to a storage medium and reloaded.

The following minimum requirements must be met in order to commission the ECMR using the "Start-up ECMR" software:

Processor:	Intel Pentium or higher
Operating system:	WINDOWS Vista, XP, 2000, NT, ME, 98, 95
Graphics card:	Windows compatible, color
Resolution:	At least 800 x 600 pixels
Drives:	CD drive
	Hard disk (5 MB available) (software can be run from the CD)
Memory:	At least 8 MB
Interface:	Serial port RS232 (COM port)

The interface cannot be used by other software (e.g. drivers).

1.4 Proper use

1.4.1 ECMR controller

The ECMR controller is used for operating electrical automation components and belongs to the scope of delivery. The ECMR (EC Motor Controller) is configured for the respective electrical automation components before delivery.
Commissioning the ECMR is performed via the serial interface of a personal computer (PC) using the "Start-up ECMR" commissioning software which has been provided.
Installation in systems for the proper use of the ECMR is prohibited until it can be determined that the system conforms to EC Machinery Directive 89/392/EEC and the EC EMC Directive (89/336/EEC). Adherence to EN 60204 and EN 292 is also required.
Concerning Low-Voltage Directive 73/23/EEC, the harmonized standards of the EN 50178 series in connection with EN 60439-1, EN 60146 and EN 60204 are applicable to the ECMR. Adherence to system thresholds required by EMC legislation is the responsibility of the manufacturer of the system. Information about the EMC-compliant installation – e.g. grounding, handling sockets and laying lines – is provided in this documentation.
The system manufacturer must submit a hazard analysis of the system and is responsible for the functional, machinery-related and personnel safety of the system.
The ECMR is built into electrical systems or machines as a component and may be commissioned only as an integrated component.
Prior to commissioning electrical automation components, all work must be performed according to the operating instructions of the ECMR and of the concerned electrical automation components. Safety regulations must be observed.

- Mounting, installation, wiring and final inspection must be performed as described in the ECMR operating instructions.
- Mounting, installation, wiring and final inspection must be performed as described in the operating instructions of the electrical automation components.

1.4.2 "Start-up ECMR" commissioning software

The "Start-up ECMR" commissioning software is for changing and saving the operating parameters of the ECMR controller. When the connected ECMR is commissioned using the software, the connected device can be controlled directly with the setup functions. Without additional measures, these functions may not be stable due to the specific characteristics of the PC. The PC program can malfunction unexpectedly or stop working, and in the event of faults the movements which have already been started may not be able to be stopped from the PC.

The system manufacturer must submit a hazard analysis of the system and is responsible for the functional, machinery-related and personnel safety of the system. This applies particularly to the initiation of movements when using functions in the commissioning software.

– Data records saved to a data medium are not safeguarded against unwanted changes by others. Therefore, after loading a data record it is necessary to thoroughly check all parameters before the ECMR is enabled.

The ECMR is built into electrical systems or machines as a component and may be commissioned only as an integrated component.

Prior to commissioning the ECMR, all work must be performed according to the operating instructions of the ECMR and of the connected device. Safety regulations must be observed.

– Carry out mounting, installation, wiring and final inspection as described in the ECMR operating instructions.

– Carry out mounting, installation, wiring and final inspection as described in the operating instructions of the connected device.

1.5 Dangers and safety information

The operating conditions and safety information described in the operating instructions of the controller must be strictly observed.
The specified load limits must be strictly adhered to.

- **These operating instructions must be read before commissioning.** Incorrect handling of the EC Motor Controller (ECMR) may lead to injury to persons, material damage and loss of the right to warranty claims. All technical data and specifications concerning connection conditions must be strictly observed.

- Only qualified specialist personnel are allowed to perform work such as installation, commissioning and maintenance. Qualified personnel are persons who are familiar the installation, mounting, commissioning and operation of the product and have relevant qualifications for the work in question. Qualified personnel must know and observe the relevant standards and directives.

- Electronic devices are not always failsafe. Machines and systems must therefore be equipped with independent monitoring and safety devices. It must be ensured that after device failure, incorrect operation of the device, failure of regulation and control units, an open circuit etc., the drive and/or overall system is/are put into a safe operating state.

- The connected operating voltage must not exceed the specified limits (see the technical data). Voltages that are too high or mix-ups can destroy the ECMR.

- The ECMR must not be opened. All covers, protection devices and switch cabinet doors must remain closed during operation.

- The ECMR contains components that can be damaged by electrostatic charges if handled improperly. To prevent ESD damage, sensitive components must be handled, packaged and stored in specially protected surroundings.

- Never disconnect electrical connections when the voltage is on. In some cases electric arcs may occur which can injure persons and damage contacts.

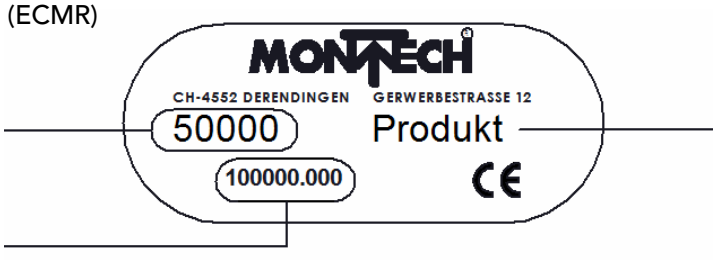
- During operation, the ECMR indicates voltage energized parts. Control and power connections may be energized even if the connected device does not move.

- Repairs may be performed only by the manufacturer (Montech AG). Improperly performed repairs may be hazardous to the user.

1.6 Additional information

The aim of the present User Manual is to enable users to employ EC Motor Controller (ECMR) correctly and safely. Should further information be required in relation to your particular application, please contact the manufacturer.
When reordering User Manuals, it is essential to quote the reference number, the product name and serial number.
This document can be obtained from our homepage www.montech.com.
Description of the type plate

EC Motor Controller (ECMR)



Reference number

Product name

Serial number

Montech AG
Management

U. D. Wagner

C. Wullschleger

1.7 Validity of the operating instructions

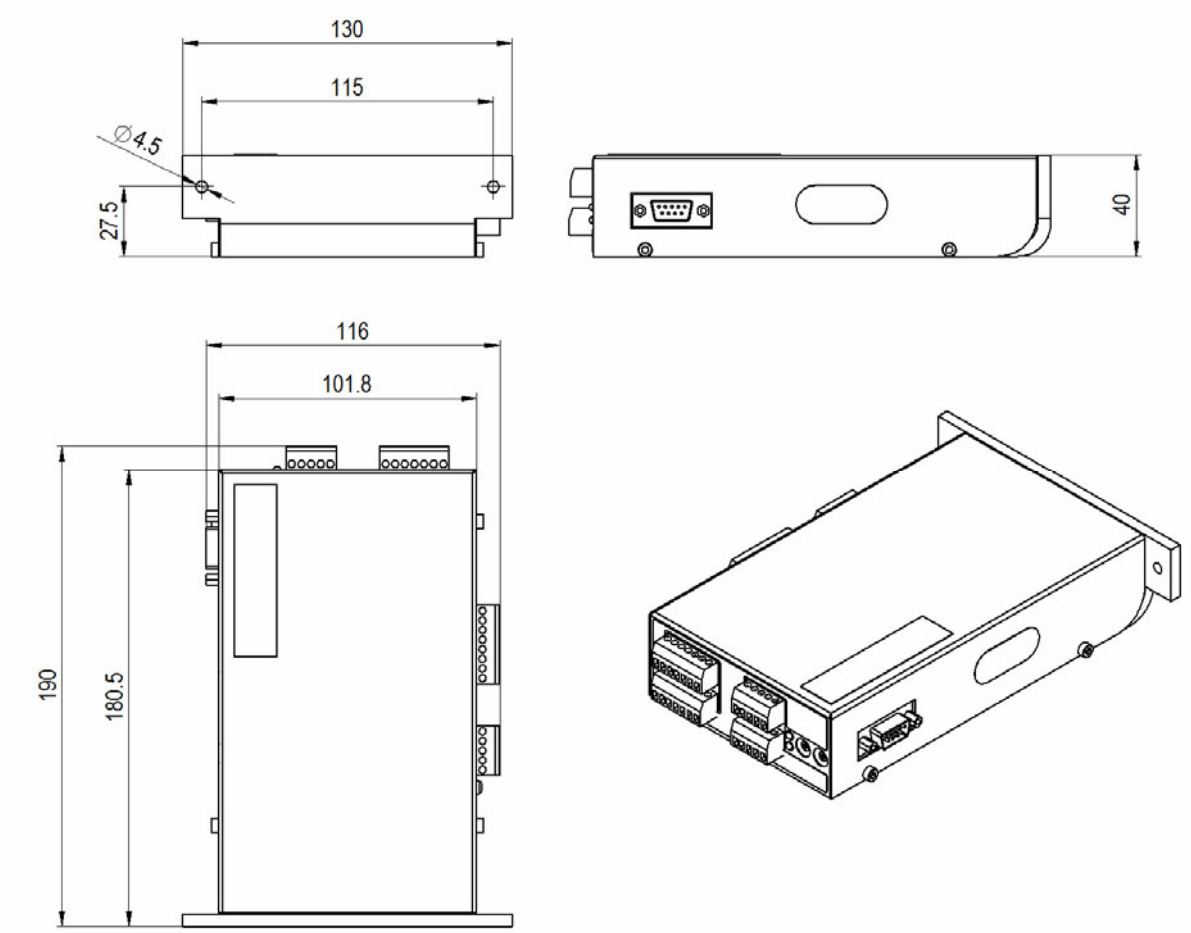
Our products are continually updated to reflect the latest state of the art and practical experience.
In line with product developments, our operating instructions are continually updated.
All operating instructions have an article number (e.g. BA-100078) and an edition number (e.g. 02/2008). The article number and edition number are displayed on the title page.

Validity

Full name	Short name	Reference number
EC Motor Controller	ECMR	57332

2 Dimensional drawing

ECMR dimensional drawing



Reference number	
ECMR	57332

3 Overview (quick start)

The explanations in this section will facilitate rapid commissioning.

3.1 Select appropriate voltage supply

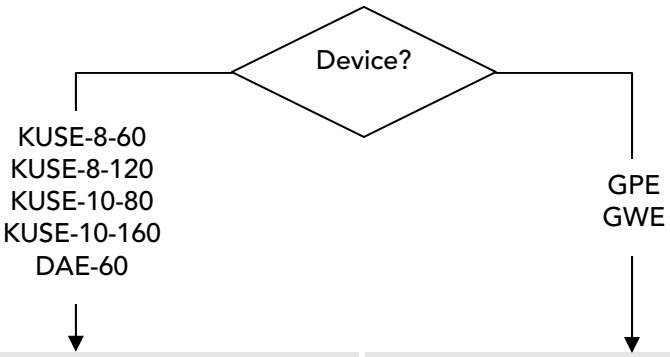
The voltage supply of the ECMR depends on the connected device. The table below lists the type of voltage supply necessary for each device. Also, achievable travel data such as speed and acceleration are directly dependent on the voltage level of the voltage supply.

Gerät	Achievable speed		Acceleration / delay		Main voltage supply	Auxiliary voltage supply
KUSE-8-60 horizontal	400	mm/s	4500	mm/s^2	48 VDC 4A	24 VDC 1A
	240[1)]	mm/s	2800[1)]	mm/s^2	24 VDC 3A	-
KUSE-8-60 vertical	400	mm/s	4500	mm/s^2	48 VDC 4A	24 VDC 1A
	210[1)]	mm/s	2800[1)]	mm/s^2	24 VDC 3A	-
KUSE-8-120 horizontal	400	mm/s	4500	mm/s^2	48 VDC 4A	24 VDC 1A
	240[1)]	mm/s	2800[1)]	mm/s^2	24 VDC 3A	-
KUSE-8-120 vertical	400	mm/s	4500	mm/s^2	48 VDC 4A	24 VDC 1A
	210[1)]	mm/s	2800[1)]	mm/s^2	24 VDC 3A	-
KUSE-10-80 horizontal	380	mm/s	4000	mm/s^2	48 VDC 4A	24 VDC 1A
	220[1)]	mm/s	2200[1)]	mm/s^2	24 VDC 3A	-
KUSE-10-80 vertical	350	mm/s	3500	mm/s^2	48 VDC 4A	24 VDC 1A
	190[1)]	mm/s	2000[1)]	mm/s^2	24 VDC 3A	-
KUSE-10-160 horizontal	380	mm/s	4000	mm/s^2	48 VDC 4A	24 VDC 1A
	220[1)]	mm/s	2200[1)]	mm/s^2	24 VDC 3A	-
KUSE-10-160 vertical	350	mm/s	3500	mm/s^2	48 VDC 4A	24 VDC 1A
	190[1)]	mm/s	2000[1)]	mm/s^2	24 VDC 3A	-
DAE-60 AW vertical	500	°/s	3000	$°/s^2$	48 VDC 4A	24 VDC 1A
	500	°/s	3000	$°/s^2$	24 VDC 4A	-
DAE-60 AW horizontal	300	°/s	2500	$°/s^2$	48 VDC 4A	24 VDC 1A
	300	°/s	2500	$°/s^2$	24 VDC 4A	-
GPE	-		-		24 VDC 1.5A	-
GWE	-		-		24 VDC 1.5A	-

1) Standard values for operation with 24 VDC
AW (DAE-60): Abtriebs Welle (= drive shaft)

3.2 Procedure

Which device will be operated with the ECMR?



	Position control		**Torque control**	
Wiring	Voltage supply	5.7.1	Voltage supply	6.5.1
	Motor	5.7.2	Motor	6.5.2
	Encoder	5.7.2	Digital I/Os	6.5.3 6.5.4
	Optional restraining brake	5.7.2		
	Digital I/Os	5.7.3 5.7.4		
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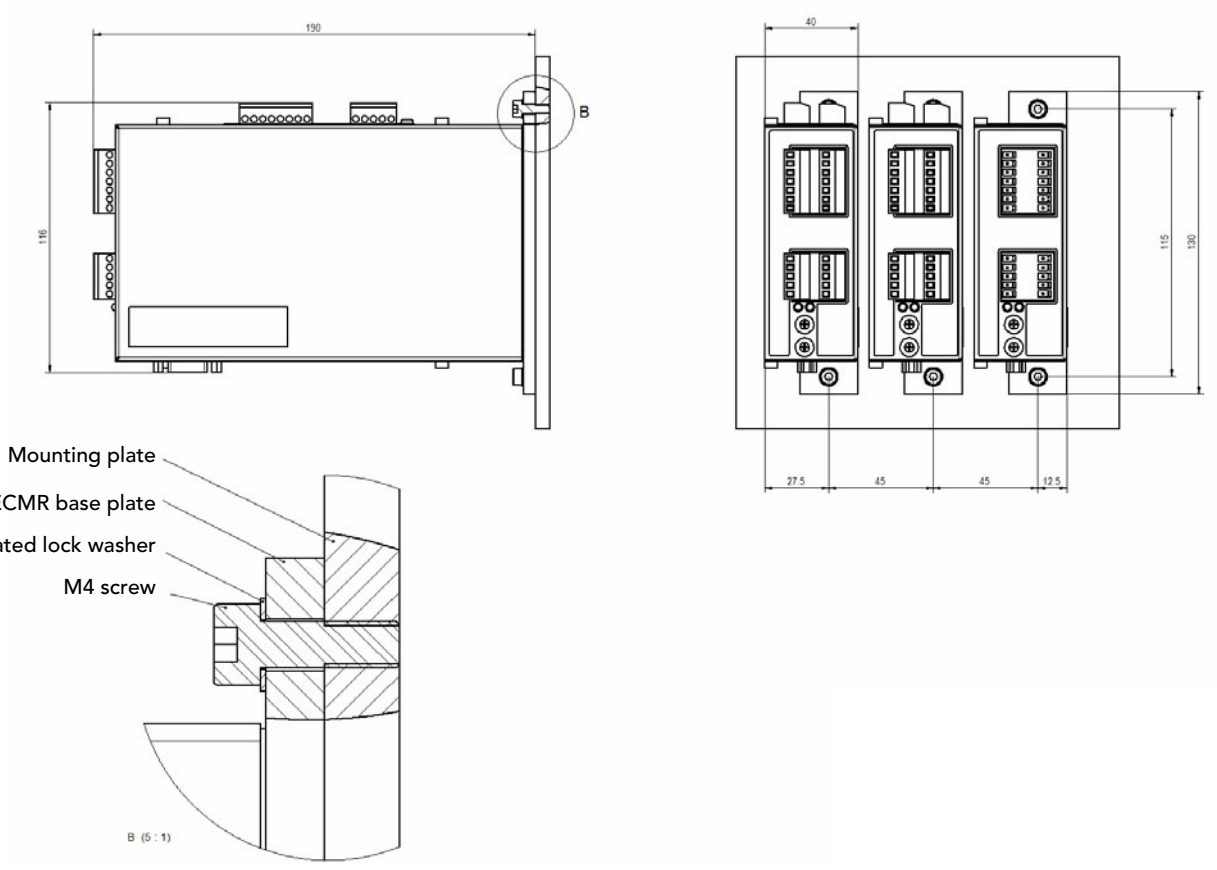
	Launch software	5.10	Launch software	6.9
	Read out configuration	5.10.1	Read out configuration	6.9.1
	Select required device	5.10.2	Select required device	6.9.2
	Set and write parameters	5.10.3	Set and write parameters	6.9.3
	Save motion task	5.10.2.1	Set torque "Current" and speed via potentiometers	6.8
Commissioning	Enable	5.10.2	If necessary, select torque "Current" and speed via digital I/Os	6.6.1
	Reference run	5.5 5.10.2	Enable	6.9.2 6.6.1
	Start motion task	5.6 5.8.1	Actuate direction via digital I/O	6.6.1
	If errors occur, remedy errors	5.10.2.3	Exit software	6.9
	Exit software	5.10		
Operation	Actuate ECMR via digital I/Os	5.8	Actuate ECMR via digital I/Os	6.6

4 Installation

4.1 Mounting

The ECMR is vertically mounted on a conductive, **grounded** mounting plate in the switch cabinet.

To ensure that the ECMR is grounded, serrated lock washers have to be used. They breach the anodized coating on the base plate of the ECMR and establish a conductive connection to the mounting plate.



5 Position control

5.1 Overview

The motion tasks stored in the EEPROM of the ECMR can be selected and started via the digital inputs. A digital output reports the arrival at the target position. All key functions of the position controller can be initiated by the control system of any manufacturer.

Features
- Motion tasks are executed via digital inputs
- Automatic actuation of the PM stop brake
- 31 motion tasks can be stored in the EEPROM
- Motion tasks can be linked to each other
- Absolute and relative runs
- Reference run
- Jogging mode
- Teach-in of position values
- 4 programmable outputs with sequential InPos, threshold and cam functions
- Software limit switch
- Customizable following fault window
- Customizable window for InPos message
- Sin^2 acceleration and braking ramps
- Peak current monitoring
- Rated current monitoring

Commissioning software functions
- Select connected device
- Import/export configuration
- ECMR enable/disable toggle
- Edit parameters for the reference run
- Adjust reference offset
- Perform reference run
- Adjust software limit switch
- Adjust size of the InPos window
- Adjust size of the following error
- Define motion tasks
- Perform motion tasks
- Import/export motion task tables
- Select function of the programmable outputs
- Select logic of the digital I/Os
- Display the last 10 errors
- Acknowledge errors

5.2 Technical data

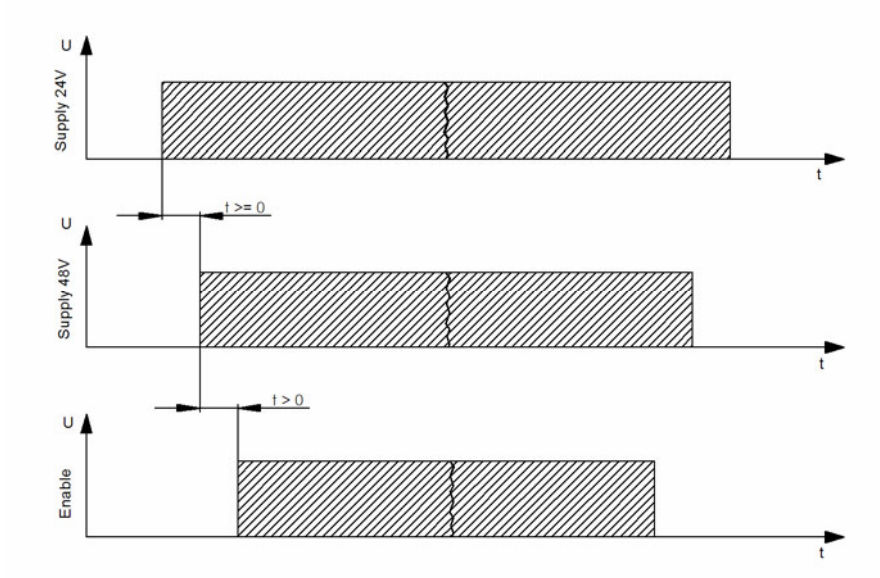
			Main voltage supply	Auxiliary voltage supply
Voltage supply for 24 V operation	1)		24 VDC (-9 + 20%), regulated; Voltage deviations influence the speed of the motor.	-
Voltage supply for 48 V operation	1)		48 VDC, regulated; voltage deviations influence the speed of the motor	24 VDC (-9 + 20%), regulated; voltage supply for controller and digital I/O.
Current consumption (without motor current)			150 mA	
Digital inputs			High: 22.8 VDC - 28.8 VDC Low: 0 VDC - 5.7 VDC transient protected	
Number of digital inputs	2)		14	
Digital outputs			Open source, 24 VDC, max. 1 A with 24 V, short circuit proof	
Number of digital outputs	2)		8	
Number of motion tasks can be stored	2)		31	
Control input connections			2 mini Combicons, 7-pin	
Signal output connections			2 mini Combicons, 5-pin	
PC interface			RS-232 (9-pin male D-Sub)	
Protection type			IP20	
Weight		[kg]	0.6	
Ambient:	Temperature	[°C]	10…50	
	Rel. humidity	[%]	5%-85% (without condensation)	
	Purity of the air		Normal workshop atmosphere	
Installation type of the controller			Vertical (switch cabinet)	
Dimensions (H x W x T) without plug			130 x 40 x 190 [mm]	
Warranty period			2 years, commencing from the date of delivery	

1) Minimum output currents: see Section 3.1
2) If the stored configuration is position-controlled (see Sections 3.2 and 1.3.1)

5.3 On and Off switching behavior

The diagram below shows the functionally correct sequence when the ECMR is switched On and Off.

Caution:
Before enabling, ensure that the proper configuration is stored for the device!



Caution:
For devices that operate with 48 VDC, the voltage supply of the motor (48 VDC) must be applied before the ECMR is permitted to be enabled (Enable)!

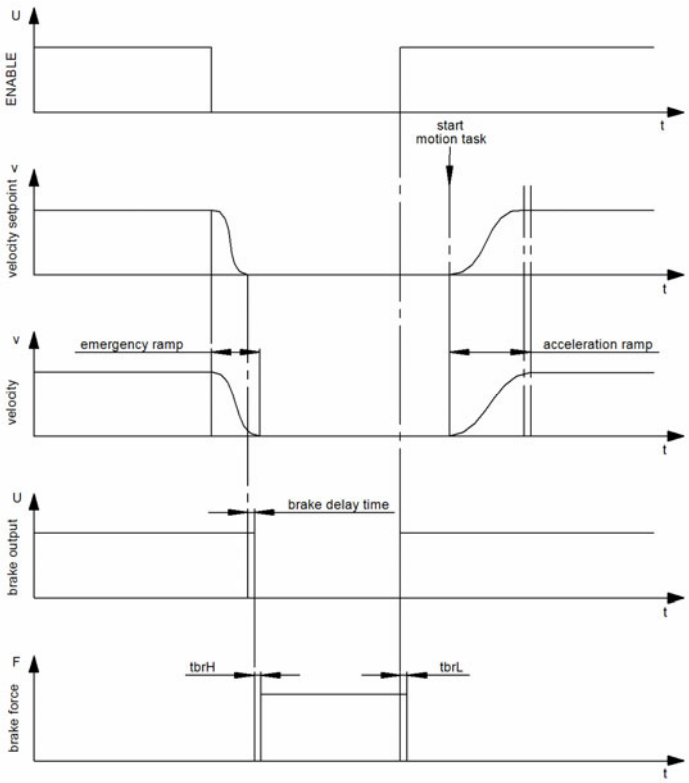
5.4 Emergency-off function

The emergency-off function serves to bring the connected device to a standstill as quickly as possible in the event of danger.

- The emergency-off function must be able to be initiated by a single person.
- The emergency-off function must always be ready for operation and available.
- The user should not have to think about how to use the device – it should be easy to use.

Implementing the emergency-off function:
Removing the enable signal during the procedure results in emergency braking. The drive brakes with the configured emergency brake ramp and remains at a standstill without torque.
When the calculated target standstill position of the brake ramp is reached, the stop brake is activated after the brake delay time and then the final stage of the ECMR is disabled.

Putting into operation again:
The enable signal enables the final stage of the ECMR and the stop brake is deactivated. If an error message is pending, the source of the error must be rectified and the error acknowledged before a new motion task can be started. (See Section 5.10.2.3.)

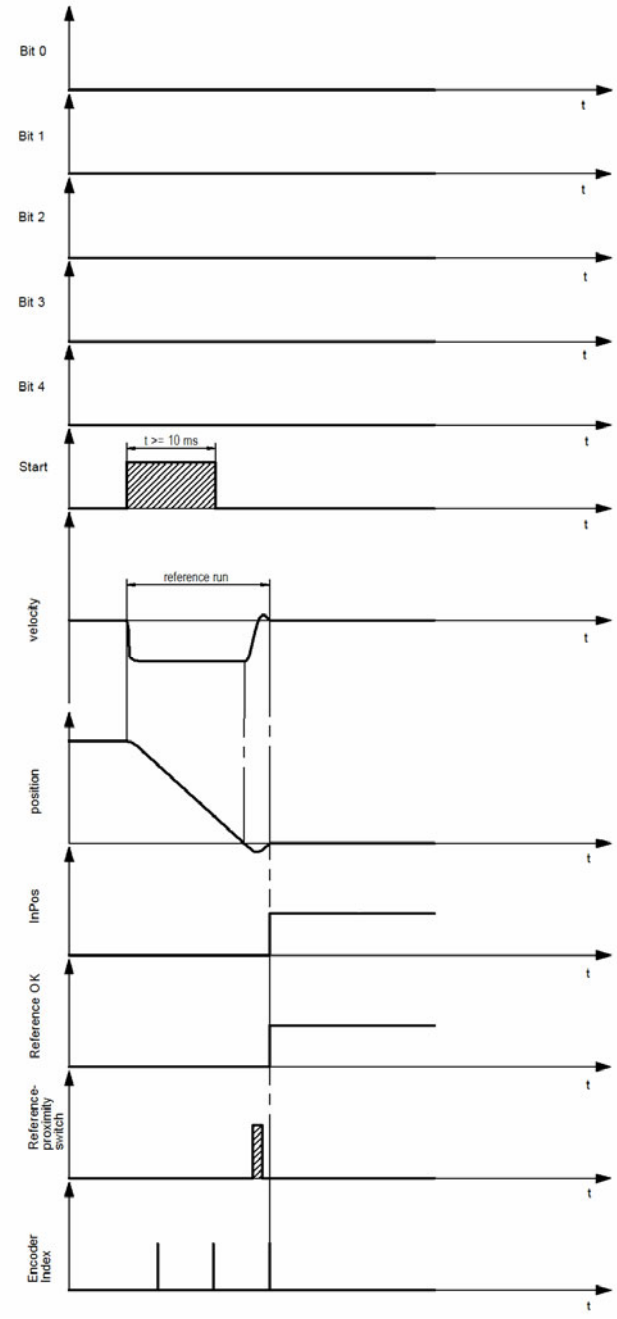


5.5 Reference run sequence

The reference run is an absolute motion task and serves to set the drive to zero for the following positioning task.
After the reference run the ECMR sets the InPos and Reference OK outputs.

Caution:
To be able to perform the reference run, the ECMR must be in the "enable" state; no errors may be pending..

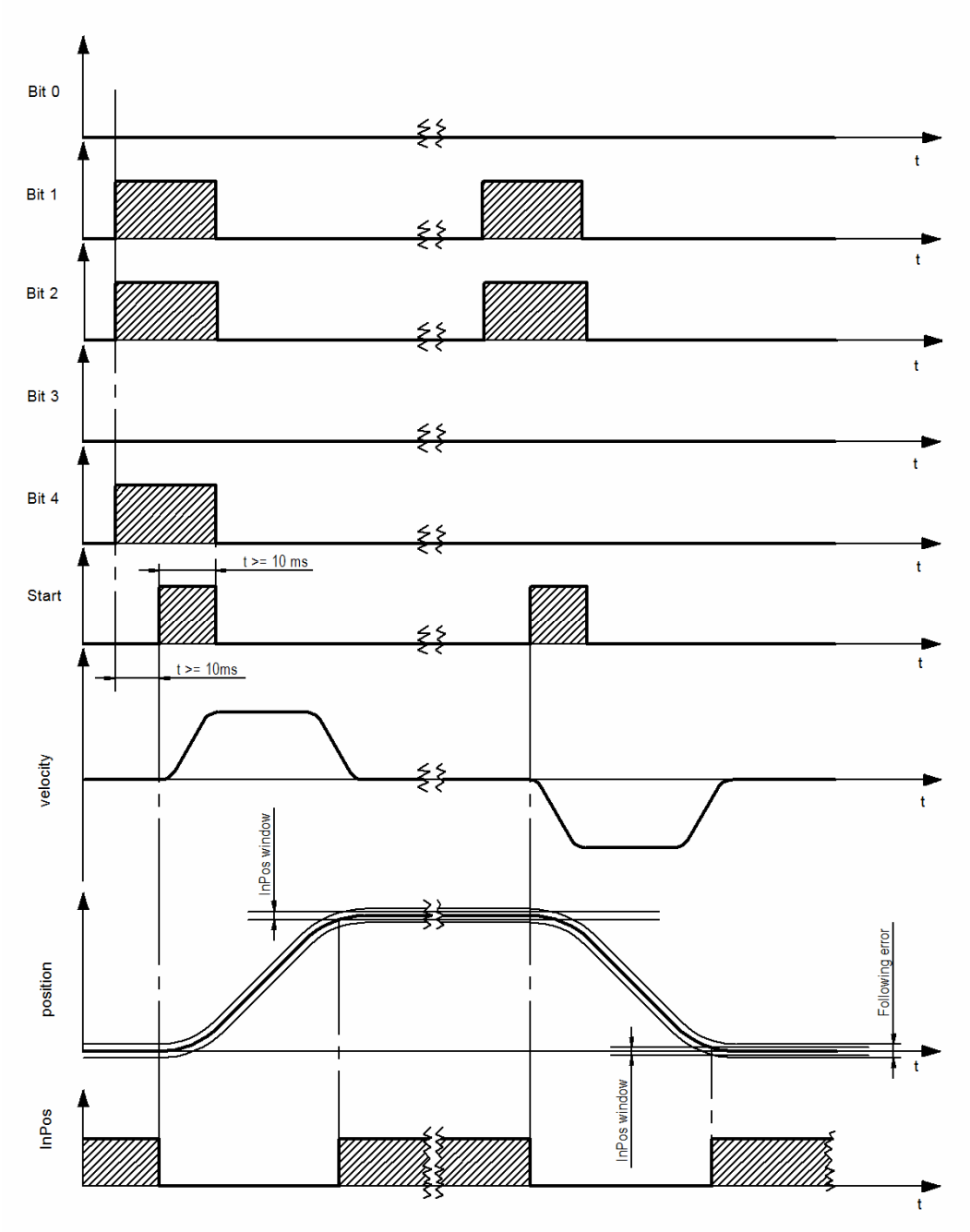
The reference run is set to the first zero crossing of the encoder (index) after recognizing the reference proximity switch flank. The encoder shows an index per revolution. This makes positioning to the zero point unambiguous within one motor revolution.



5.6 Motion task sequence

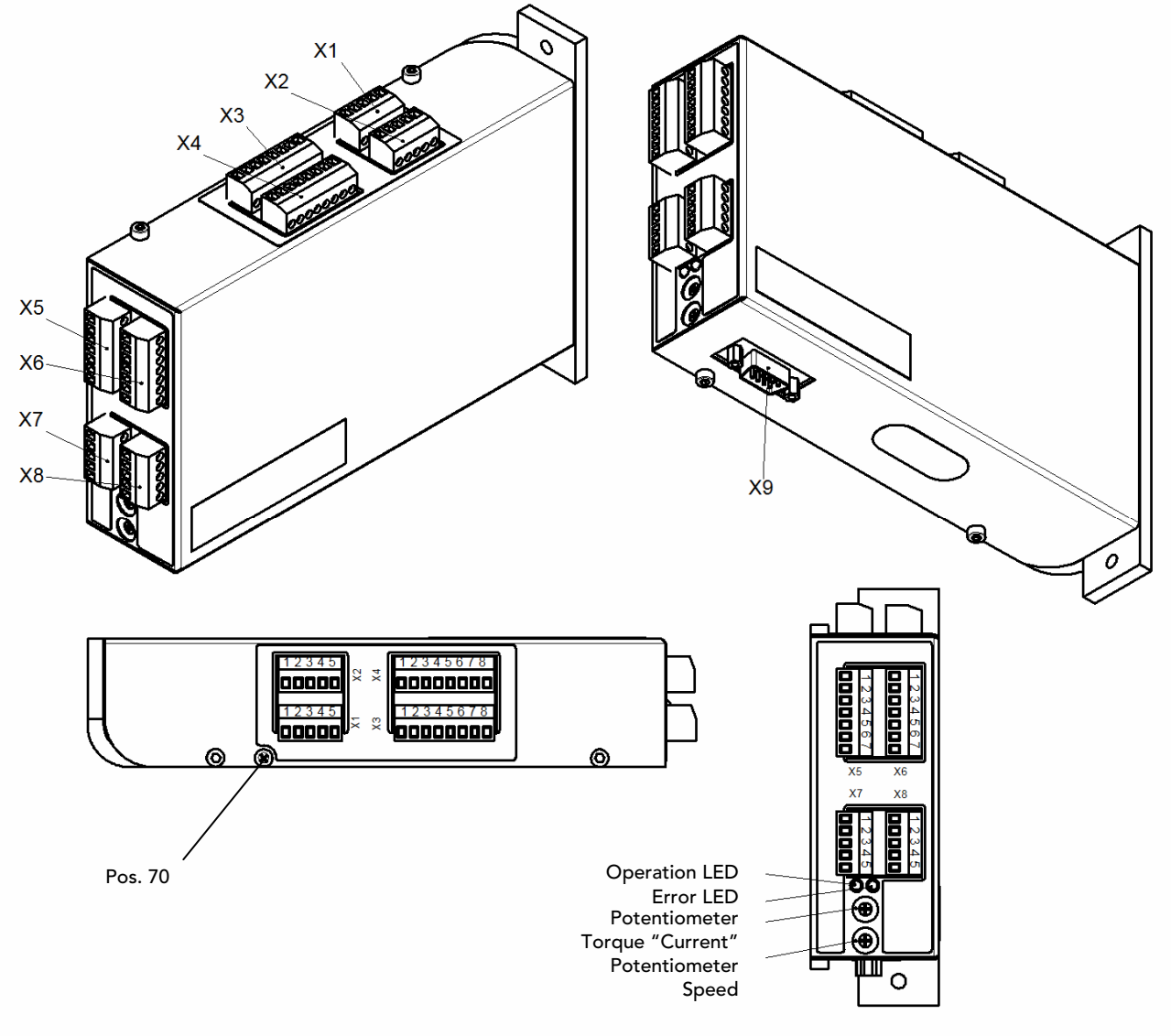
The following shows the functionally correct signal sequence for starting a stored motion task. The diagram shows an example with motion tasks 22 and 6.

Caution:
To be able to perform a motion task, the ECMR must be in the "enable" state (i.e. no errors pending) and the reference run performed (i.e. reference point set).



5.7 Wiring

The wiring described in this section refers to the connector designations in the figure below.



- Only qualified specialist personnel are allowed to perform work such as installation, commissioning and maintenance.
- The ECMR must always be in a de-energized state (no voltage supplied) when wiring is performed.
- Never disconnect electrical connections when the voltage is on. In some cases electric arcs may occur which can injure persons and damage contacts.

5.7.1 Voltage supply

The voltage supply of the ECMR depends on the connected device.

Voltage supply for 24 V devices
The following devices require 24 V power:

- DAE electric rotary drive
- KUSE (compact universal electric wagon)
  Likewise, KUSEs may be operated only with 24 V power supply. This, however, reduces maximum speed (Section 3.1).

Terminal	Designation	
X1-1	+24 V	Bridge on X1-2
X1-2	Motor windings	Bridge on X1-1
X1-3	+48 V	n.c.
X1-4	+48 V	n.c.
X1-5	GND	n.c.

Terminal	Designation	
X2-4	+24 V	+24 V power supply
X2-5	GND	GND power supply

n.c.: Not connected

Voltage supply for 48 V devices
If the full speed range is to be utilized, the following devices require a 48 V power supply in addition to the 24 V power supply (Section 3.1):

- KUSE (compact universal electric wagon)

Terminal	Designation	
X1-1	+24 V	n.c.
X1-2	Motor windings	Bridge on X1-3
X1-3	+48 V	Bridge on X1-2
X1-4	+48 V	+48 V power supply
X1-5	GND	GND power supply

Terminal	Designation	
X2-4	+24 V	+24 V power supply
X2-5	GND	GND power supply

5.7.2 Components (DAE, KUSE)

Motor

Controller		Component connection cable 3x0.5 mm²
Terminal	Designation	Wire lead color
X2-1	Motor winding 1	White
X2-2	Motor winding 2	Brown
X2-3	Motor winding 3	Green
Pos. 70*	Cable screening	Screen

*see Section 5.7

Controller		Connection cable component 18x0.14mm2
Terminal	Designation	Wire lead color
		White
		Brown
		Green
X3-1	U hall sensors	Red
X3-2	GND hall sensors	Blue
X3-3	Hall sensor 1	Yellow
X3-4	Hall sensor 2	Gray
X3-5	Hall sensor 3	Pink

Encoder

Controller		Connection cable component 18x0.14mm2
Terminal	Designation	Wire lead color
X4-1	Vcc	Gray-pink
X4-2	GND encoder	Red-blue
X4-3	A not	White-green
X4-4	A	Brown-green
X4-5	B not	White-yellow
X4-6	B	Yellow-brown
X4-7	I not	White-gray
X4-8	I	Gray-brown

n.c.: Not connected

Proximity switches

Controller		Connection cable component 18x0.14mm2
Terminal	Designation	Wire lead color
-	U proximity switch	(Red)
-	GND proximity switch	(Blue)
X3-6	Output	Black

Stop brake (optional)

Controller		Connection cable component 18x0.14mm2
Terminal	Designation	Wire lead color
-	GND	(Blue)
X3-7	Release brake (24V)	Violet

5.7.3 Digital inputs

Terminal	Designation
X5-1	Motion task bit 0
X5-2	Motion task bit 1
X5-3	Motion task bit 2
X5-4	Motion task bit 3
X5-5	Motion task bit 4
X5-6	Start motion task
X5-7	Stop motion task

Terminal	Designation
X6-1	Enable
X6-2	Clear error
X6-3	Reset
X6-4	Release brake
X6-5	Start next motion task
X6-6	Jog left
X6-7	Jog right

5.7.4 Digital outputs

Terminal	Designation
X7-1	Enable
X7-2	Reference OK
X7-3	InPos
X7-4	Error
X7-5	GND

Terminal	Designation
X8-1	Programmable output 1
X8-2	Programmable output 2
X8-3	Programmable output 3
X8-4	Programmable output 4
X8-5	n.c.

n.c.: Not connected

5.7.5 Communication

D-Sub connector	Designation
X9	RS-232

5.7.6 Conductor cross section

The following core cross sections are permitted for the digital inputs and outputs:

	Min. cross section [mm^2]	Max. cross section [mm^2]
Rigid	0.14	1.5
Flexible	0.14	1.5
Flexible with crimp connector without plastic sleeve	0.25	1.5
Flexible with crimp connector with plastic sleeve	0.25	0.5

5.8 Digital inputs/outputs

The digital inputs and outputs are operated by default in "active high" mode. The logic of the digital inputs and outputs can be changed to "active low" using the software.
(Section 5.10.2.2)

This means:

Active high

	Logic 1 (high or TRUE)	Logic 0 (low or FALSE)
Digital inputs	22.8 – 28.8 VDC	0 – 5.7 VDC
Digital outputs	> Supply voltage – 0.2V 24 – 0.2 = 23.8 VDC	-

Active Low

	Logic 1 (high or TRUE)	Logic 0 (low or FALSE)
Digital inputs	0 – 5.7 VDC	22.8 – 28.8 VDC
Digital outputs	-	> Supply voltage – 0.2V 24 – 0.2 = 23.8 VDC

5.8.1 Functions of the digital inputs

Motion task bit 0-4

These inputs are for the bit coded preselection of a motion task. Up to 31 motion tasks can be preselected with the 5 bits. Motion task 0 is the reference run.
Example:

Binary					→	Decimal
Bit 4	Bit 3	Bit 2	Bit 1	Bit 0		22
1	0	1	1	0		

Start motion task

An ascending flank starts the motion task which is stored in the ECMR and which is preselected with the inputs "Motion task bit 0 – 4".
A start signal without a motion task preselection triggers the reference run.

Caution:
The motion task does not stop when the start signal is removed. The motion task can be stopped with an ascending flank on the Stop Motion Task input.

Stop motion task

An ascending flank stops the current motion task. The drive is brought to a standstill with the configured brake ramp of the current motion task.

Enable	The enable input is for enabling the ECMR. A signal on this input enables the final stage. If no signal is present, the final stage is disabled. Removing the enable signal during a motion task triggers the emergency brake ramp.
Clear Error	An ascending flank on this input triggers errors in the "minor error" category. (Section 5.10.2.3)
Reset	A signal on this input triggers a software reset of the ECMR. Current values in the working memory (e.g. reference point and errors) are deleted and the data stored in the EEPROM is loaded into working memory. The ECMR is in the normal state after a reset. Errors in the "serious error" category must be acknowledged with a reset. (Section 5.10.2.3) A reset can be performed only if the ECMR is in the disabled state.
Release brake	If the ECMR is in the disabled state, the stop brake can be released with this input so that the connected device can be moved manually. The brake remains released as long as a signal is present.
Start next motion task	The pending motion task in the current motion task sequence is started on this input with an ascending flank. Requirements: The pending next motion task must have the required settings (start: "I/O" or "I/O or time") that it can start via this input (Section 5.10.2.1). The target position of the current motion task has to be reached before the next motion task can be started.
Jog left/right	The connected device can be moved in both directions with these inputs. The movement is carried out as long as a signal is present on the concerned input and the SW limit switches are not reached. Travel speed is v_sensor of the reference run.

5.8.2 Functions of the digital outputs

Enable	Signal is output when the ECMR is enabled. The enable signal must be on terminal X6-1 for the enable and no error may occur (Section 5.10.2.3) which could lead to automatic disabling of the ECMR.
Reference OK	Signal is output if the reference point has been set by a reference run and no errors that could lead to loss of the reference point have occurred.
InPos	If the drive is within the specified InPos window, a signal is output. (Section 5.10.3)
Error	As soon as an error occurs, a signal is output. (Section 5.10.2.3)
Prog. outputs 1-4	Various functions can be assigned to the programmable outputs. (Section 5.10.2.2)

5.9 Status display

The two LEDs (operation and error) indicate the status of the controller.

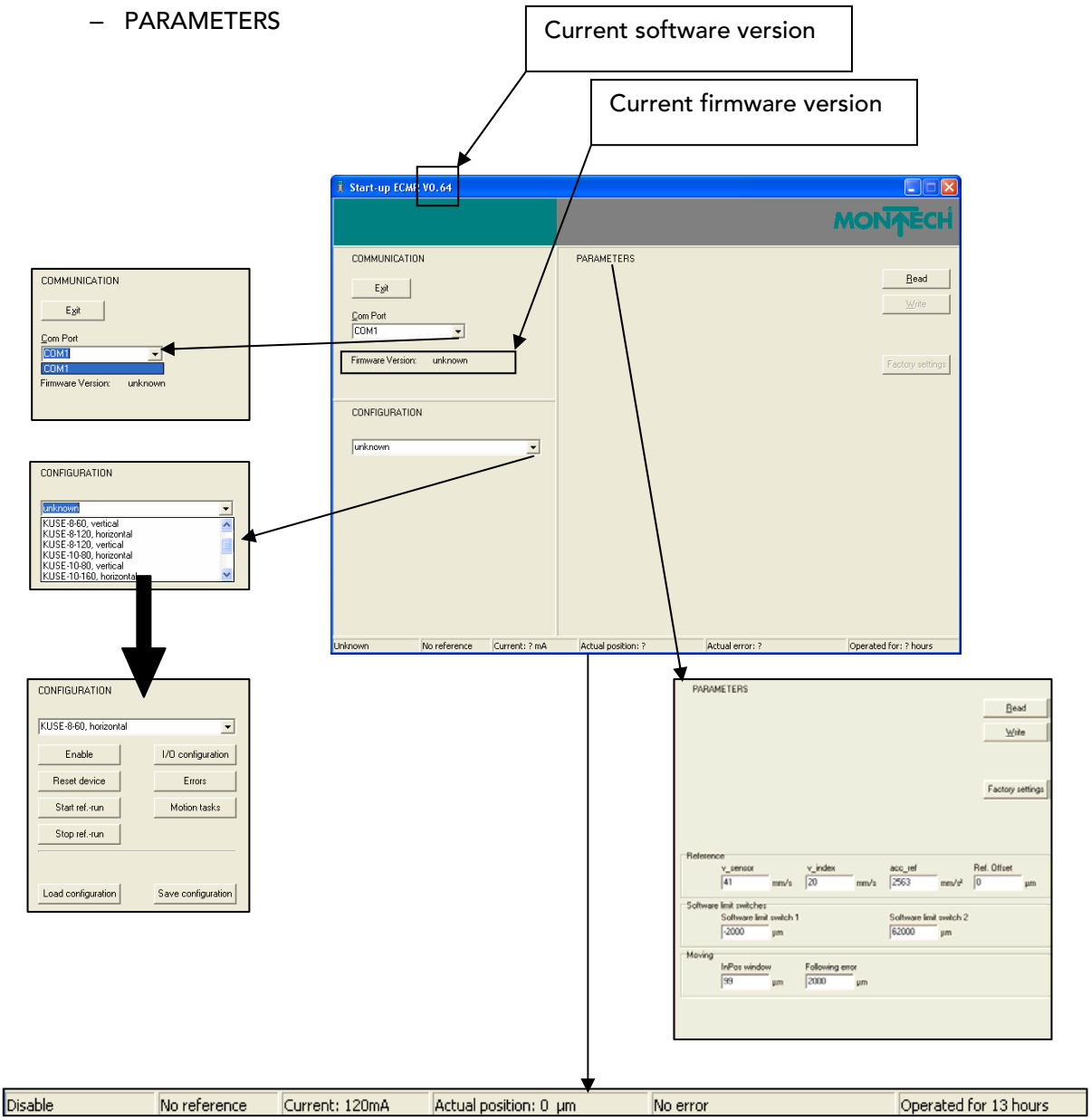
Green LED	The green LED is the operation LED. As soon as the ECMR is connected to a 24 V voltage supply, the LED becomes lit. 48 V voltage supply has no influence on this LED.
Red LED	The red LED is the error LED. As soon as there is an error on the ECMR, this LED becomes lit. The type of error can be read out using the commissioning software via the RS232 interface.

5.10 ECMR commissioning software

With the current version of the commissioning software, ECMRs that do not have the current firmware can be configured. If an ECMR with an older firmware version does not have the full range of functionality, the absent functions are suppressed in the commissioning software.

When the "Start-up ECMR" commissioning software is launched, the main window appears. It is divided into the following parts:

- COMMUNICATION
- CONFIGURATION
- PARAMETERS



5.10.1 Communication

In the Communication field you can configure the settings for the serial communication via the RS232 interface.
To enable communication with the ECMR, the COM port to which the ECMR is connected has to be selected in the drop-down menu.
Communication can be checked with the Read button. Following successful reading, the current configuration of the ECMR and its firmware version are displayed.

The buttons that initiate communication are located in the top right corner of the "PARAMETERS" field.

Read	Reads the current configuration and stored parameters.
Write	Writes the selected configuration and parameters that have been set.

If the Read or Write button is actuated, the transmission progress is shown in a separate window. The transmission can be cancelled with the Stop button.

– Caution: Data can be sent to the ECMR only if it is in the disabled state.

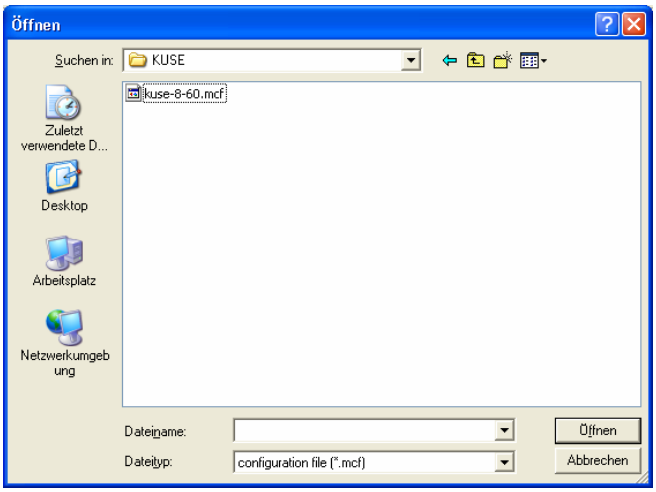
5.10.2 Configuration

The data record for the device connected to the ECMR can be selected in the drop-down menu. The required parameters for the selected device are loaded in the parameters field.

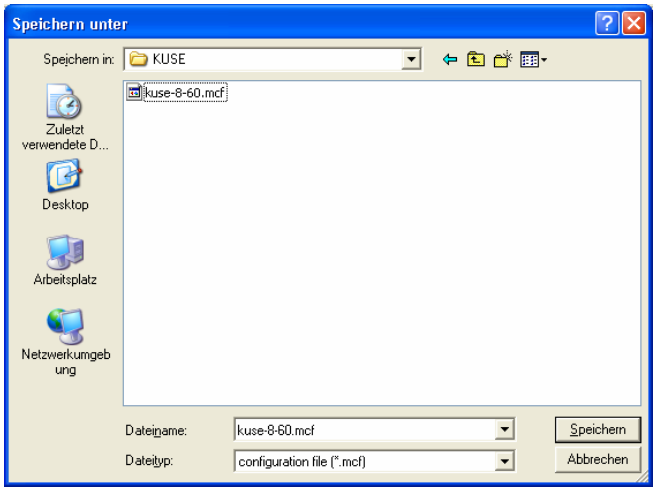
Enable/Disable	If the ECMR is in the disabled state, this button (Enable) enables the ECMR. If the ECMR is in the enabled state, this button (Disable) disables the ECMR.
Reset Device	This button triggers a software reset of the ECMR. Current values in the working memory (e.g. reference point and errors) are deleted and the data stored in the EEPROM is loaded into working memory. The ECMR is in the normal state after the reset. Errors in the "serious error" category must be acknowledged with a reset. (Section 5.10.2.3) A reset can be performed only if the ECMR is in the disabled state.
Start ref. run	This button triggers the reference run.
Stop ref. run	This button stops the reference run.

Motion tasks	Opens the “Motion tasks” window. (Section 5.10.2.1)
Errors	Opens the “Errors” window. (Section 5.10.2.3)
I/O configuration	Opens the “I/O configuration” window. (Section 5.10.2.2)
Load configuration	The Load configuration button loads the configurations stored in a Montech configuration file (.mcf). To load the Montech configuration file, the name of the file must match the currently configured device type (drop-down menu) of the ECMR.

Name of mcf-files
KUSE-8-60 → Currently configured device typ

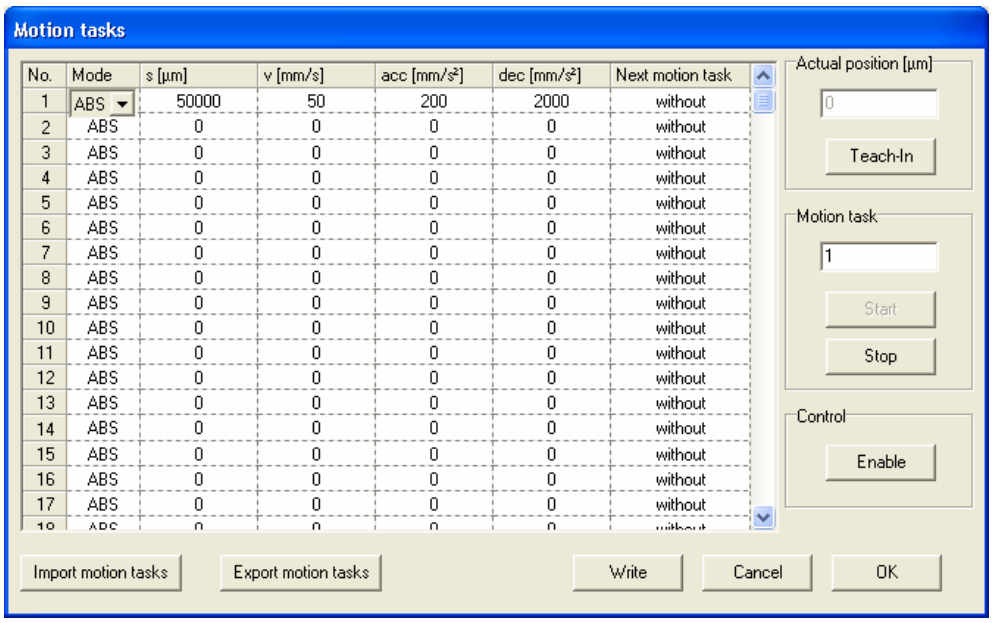


Save configuration	This button saves the current configuration in a Montech configuration file (.mcf). The current device designation is added to the file name. It can be saved anywhere.



5.10.2.1 Motion tasks

The "Motion task" button in the Configuration field opens the Motion task window.



Description of the table

No. — Motion task number

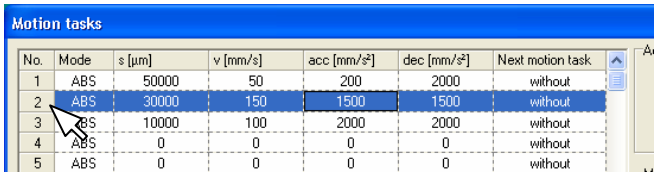
Mode — This selection defines whether the motion task is to be interpreted as a relative or absolute motion task.

Mode	Description
ABS	Defines motion for an absolute target position relative to the reference point.
REL	Defines a motion relative to the target position of the most recently executed motion task.

s — This parameter defines the target position for absolute motion tasks.
The "Teach-In" button copies the actual position into the active cell.
See Section 5.11 for the procedure.

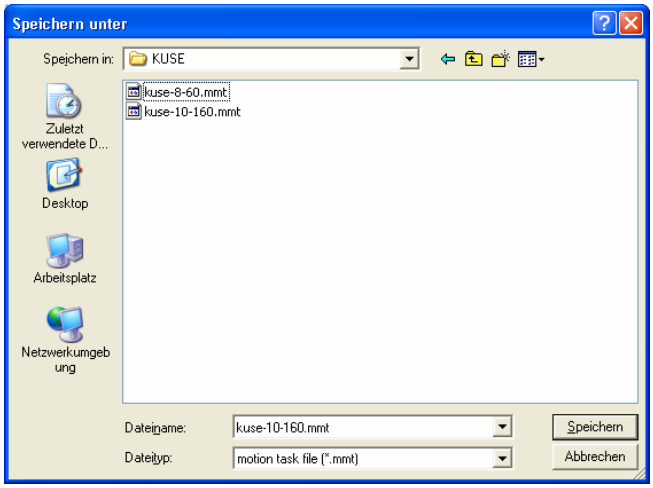
This parameter defines the travel route for relative motion tasks.

v	This parameter defines the travel speed.
acc	This parameter defines the acceleration. The acceleration ramp is $\sin^2$ shaped.
dec	This parameter defines the brake delay. The brake ramp is $\sin^2$ shaped.
Next motion task	This field defines a following motion task. A drop-down menu appears when the field is clicked. If no following motion task is to be active, the "without" entry must be selected. Selecting a following motion task number opens the "Next motion task" window. (Section 5.10.2.1) Note: Settings: "without" → InPos signal active Settings: ≠ "without" → InPos signal deactived → see programmable outputs: "between two nmts"
Delete motion tasks	Motion tasks can be deleted by clicking the motion task number ("No." column) and then pressing delete. All values of the motion task are set to 0. Multiple motion tasks can be selected together and deleted.



Description of the buttons and fields

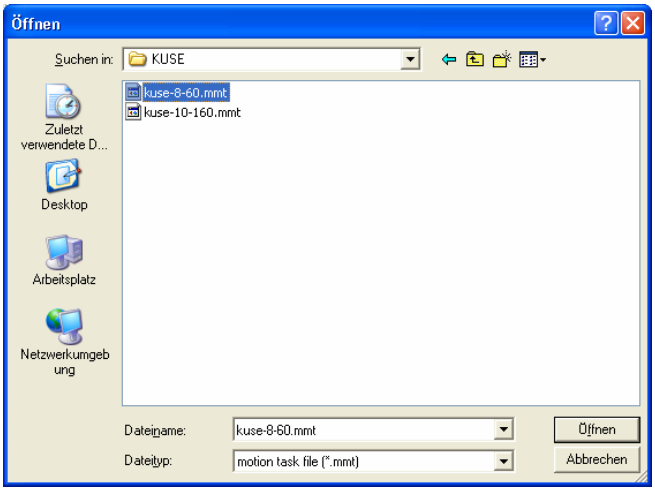
Export motion tasks	This button is used to export the motion task table. The entire motion task table including the next motion task settings can be exported to a Montech motion task file (.mmt). The storage location and name of the file can be freely selected. The current device designation is added to the file name.



Import motion tasks

With this button you can import exported motion task tables in .mmt format. Selecting the exported file and clicking the Open button imports the motion task table.
To be able to load the Montech motion task file, the name of the file must match the currently configured device type (drop-down menu) of the ECMR.

Name of the mmt-files		Currently configured device type
KUSE-8-60	→	KUSE-8-60, horizontal



Actual position

Shows the actual position of the connected device.

Teach-In

The “Teach-In” button copies the actual position into the selected cell of the “s” column.
See Section 5.11 for the procedure.

Motion task

The motion task which is to be started with the “Start” button can be entered in this cell.
Clicking the motion task table copies the selected motion task into this cell.

Start

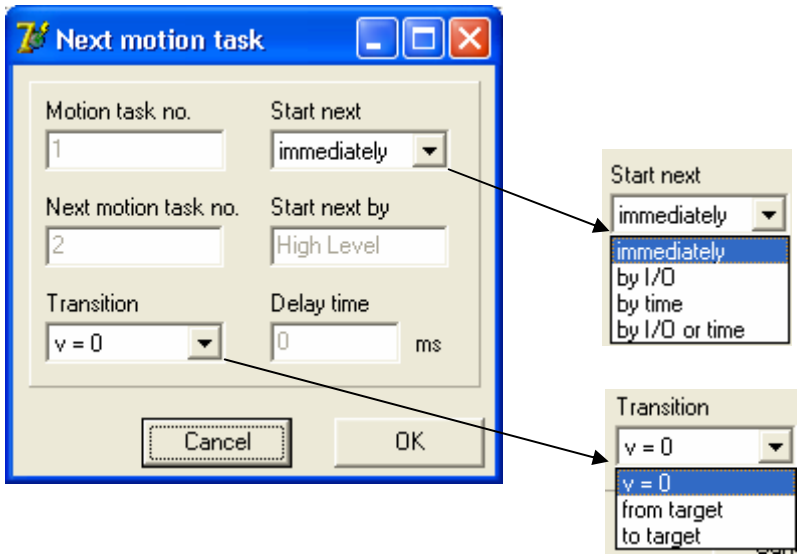
This button starts the motion task with the number that was entered in the "Motion task” field. (If following motion tasks are defined, the entire sequence is worked through.)

Stop

The “Stop” button stops the current motion task. The drive is brought to a standstill with the configured brake ramp of the current motion task.

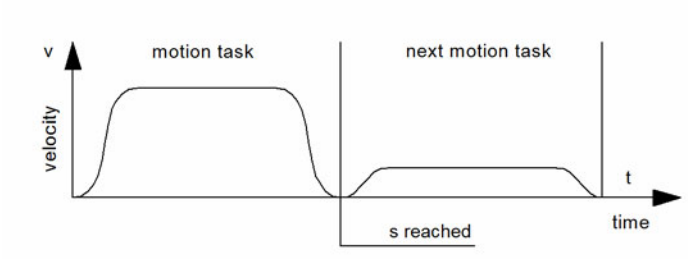
Enable/Disable	If the ECMR is in the disabled state, this button (Enable) enables the ECMR. If the ECMR is in the enabled state, this button (Disable) disables the ECMR.
Write	This button sends the changes to the ECMR and saves them in the EEPROM. The window remains open.
Cancel	This button exits the window. The changes are lost.
OK	If you leave the window with this button, the changes are sent to the ECMR and saved in the EEPROM.

Next motion task



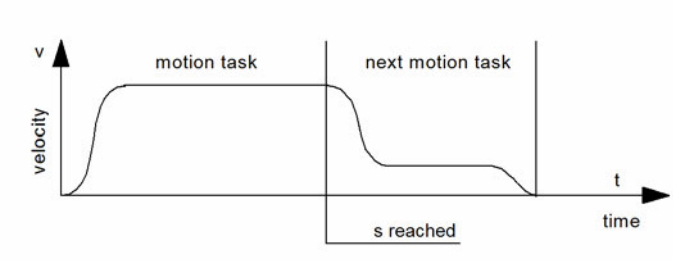
Motion task no.	Motion task number
Next motion task no.	Number of the next motion task
Transition	The transition between the current motion task and the next motion task can be selected in this drop-down menu.

v=0
The drive brakes to standstill before the next motion task is started.



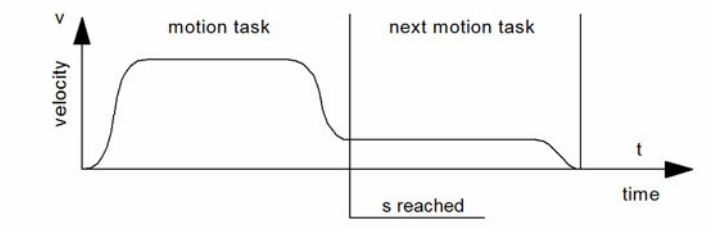
From target
The drive travels with "v" of the current motion task to the target position and accelerates/brakes on-the-fly to "v" of the next motion task. For acceleration as well as for braking, the configured acceleration "acc" of the next motion task is used.

– For opposite motion tasks the function v = 0 must be selected.



To target
The drive travels with "v" of the current motion task and accelerates/brakes with the configured delay "dec" so that it reaches the speed of the next motion task at the target position.

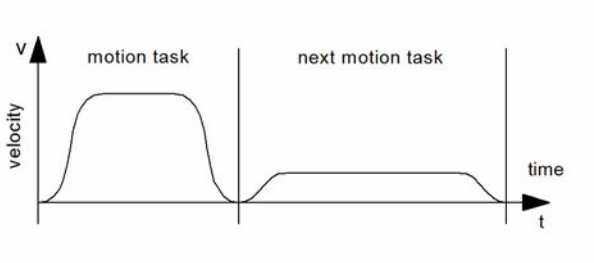
– For opposite motion tasks the function v = 0 must be selected.



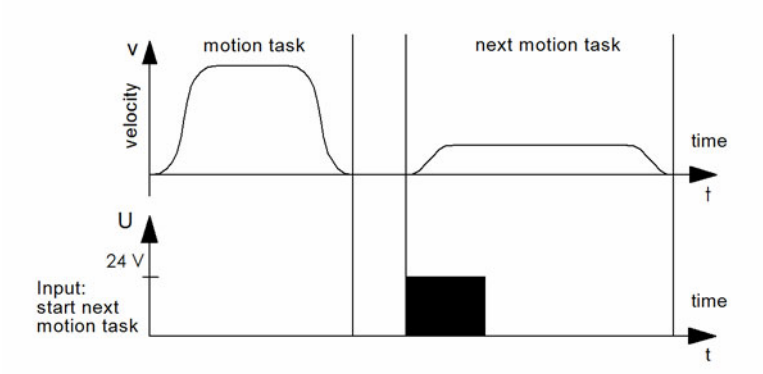
Start next

In this drop-down menu you can select how the next motion task is to be started. The following functions are available:

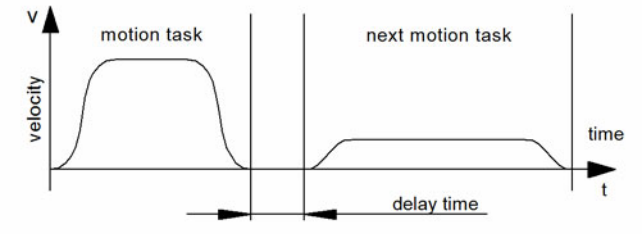
Immediately
The next motion task is started immediately after the current motion task reaches the target position.



I/O
The next motion task is started with a signal on the digital input "Start following task". The target position of the current motion task has to be reached before the next motion task can be started.
In the "Start next by" field the logic of the digital input is displayed.



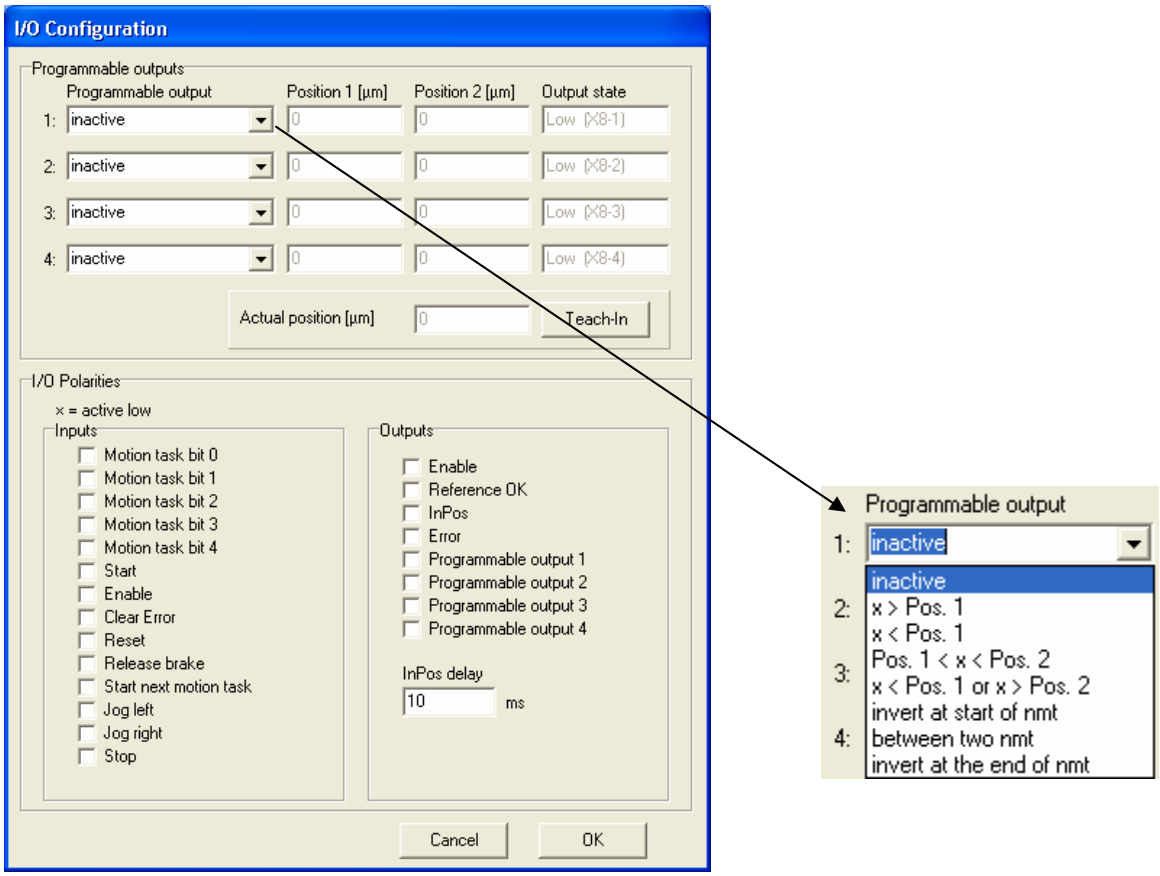
Time
The next motion task is started after a defined delay time after the target position is reached. The delay time can be specified with the "delay time" parameter.



	I/O or time The next motion task is started with a signal on the digital input “Start following task” or after a defined delay time. The next motion task is started by the event that occurs first. Before the next motion task can be started via the digital input, the target position of the current motion task must be reached. The delay time begins when the target position of the current motion task is reached. In the “Start next by” field the logic of the digital input is displayed. The delay time can be specified with the “delay time” parameter.
Start next by	This field shows the logic of the digital input “Start next motion task”. The logic of the digital input can be changed in the “I/O configuration” window. (Section 5.10.2.2) High level: A change of the signal from 0 to 24 V is interpreted as start signal. Low level: A signal change from 24 to 0 V is interpreted as a start signal.
Delay time	After the current motion task has reached the target position, the next motion task waits the entered delay time before starting. The entry is in ms.
Cancel	The Cancel button voids the changed settings. The window is closed.
OK	The OK button applies the changed settings and closes the window.

5.10.2.2 I/O configuration

The functions for the programmable outputs and the logic for the digital inputs and outputs can be selected in the "I/O configuration" window.
The values for positions 1 and 2 can be manually entered or copied with the teach-in function. (Section 5.11)



Programmable outputs

The following functions are selectable for all four programmable outputs:

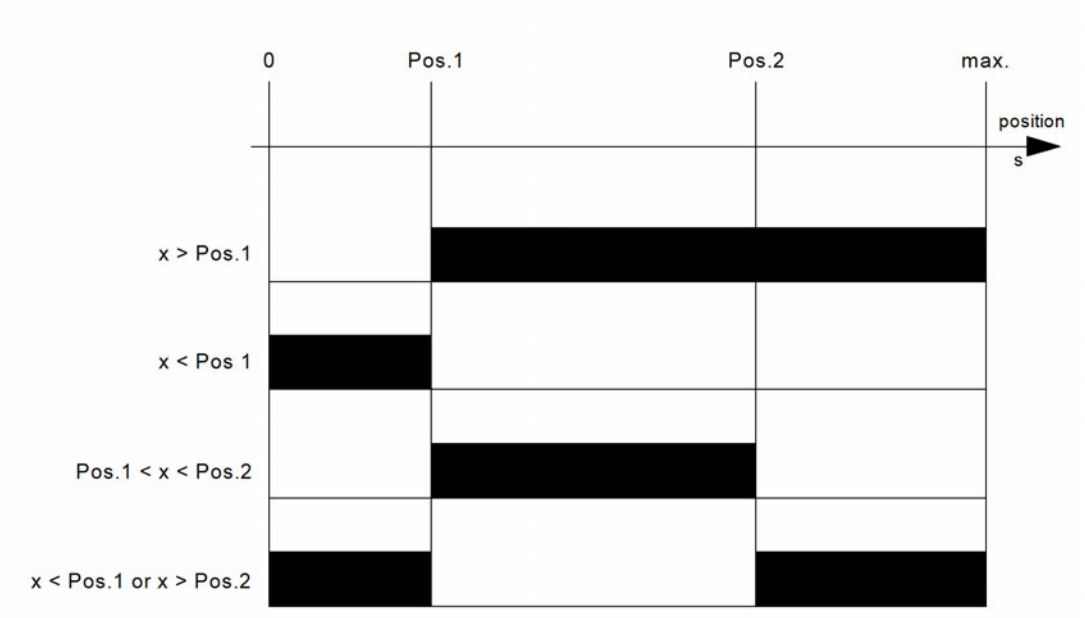
Inactive
No function is assigned to the output.

x < Pos 1
Reports undershooting position 1.

Pos 1 < x < Pos 2
Message is output when the drive is between position 1 and position 2.

x > Pos 1
Reports exceeding position 1.

x < Pos 1 or x > Pos 2
Message is output when the drive is outside position 1 and position 2.

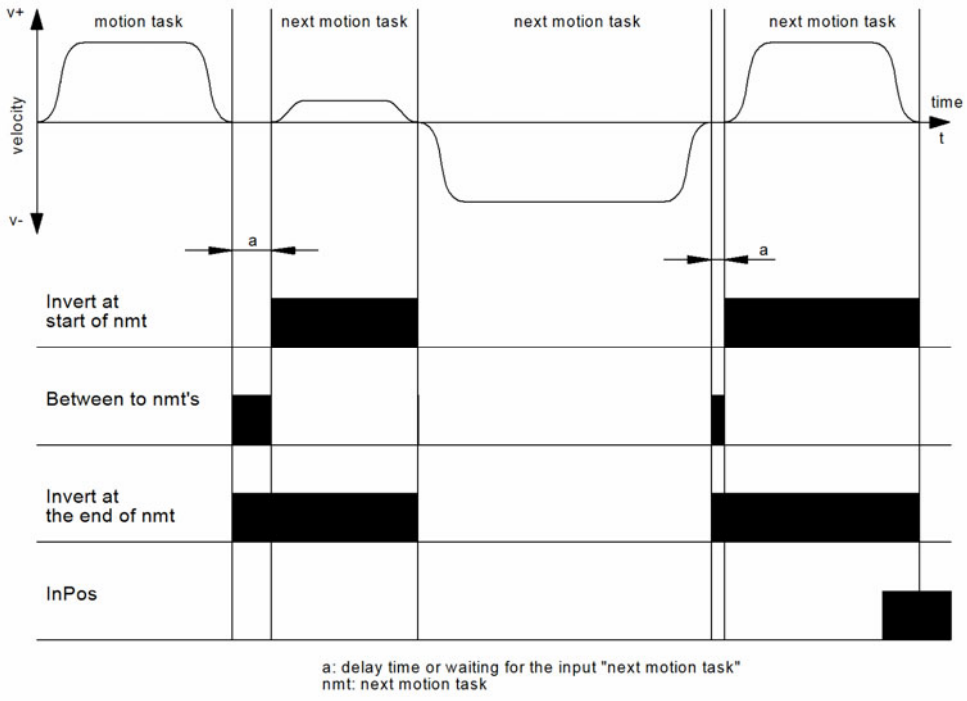


Intermediate messages can be generated for motion task sequences with the three following functions. With this function, when the first motion task of a motion task sequence is started, the output is set low.

Invert at start of nmt
The output is inverted when the next motion task (nmt: next motion task) is started.

Invert at the end of nmt
The output is inverted at the end of a motion task.

Between two nmts
The output is switched high between two motion tasks.

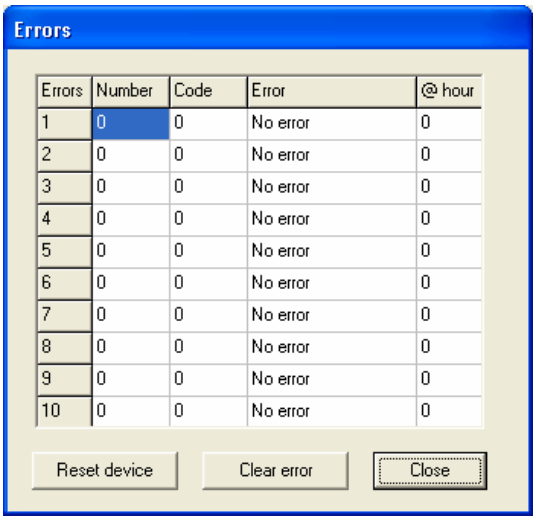


Position 1	This parameter defines an absolute position to the reference point at which the selected function reacts.
Position 2	This parameter defines an absolute position to the reference point at which the selected function reacts.
Output state	Shows the status of the output signal (high or low) and the terminal of the output.
Actual position	Shows the actual position of the connected device.
Teach-In	The “Teach-In” button copies the actual position into the selected cell (position 1 or position 2) of the “s” column. See Section 5.11 for the procedure.
I/O polarities	The logic of the individual input and output signals can be defined in this field. Active high: 0 V → Low 24 V → High Active low: 0 V → High 24 V → Low
InPos delay	This parameter defines the minimum delay time between two InPos signals. When a motion task starts, the InPos message is taken back and the monitoring of the In-Position window is re-activated only after the configured time.
Cancel	The Cancel button voids the changed settings. The window is closed.
OK	The OK button saves the changed settings to the ECMR.

– Caution: To be able to save the settings, the ECMR must be in the disabled state.

5.10.2.3 Errors

Errors are indicated with the red error LED on the front panel. The current error is visible in the status line of the software.
The error history can be called up with the Errors button. The last 10 errors and when they occurred are displayed.



Number:	Shows the no. of errors.
Code:	Shows the error code.
Error:	Shows the type of error.
@hour:	Shows the value of the operation hours counter of the ECMR when the error occured.

Reset device	This button triggers a software reset of the ECMR. Current values in the working memory (e.g. reference point and errors) are deleted and the data stored in the EEPROM is loaded into working memory. The ECMR is in the normal state after the reset. Errors in the “serious error” category must be acknowledged with a reset. A reset can be performed only if the ECMR is in the disabled state.
Clear error	This button acknowledges “minor errors”.
Close	This button closes the “Errors” window.

Serious errors

Code	Error	Explanation
1	No encoder	No encoder connected
5	Peak current	Peak current exceeded
6	Nominal current	Nominal current exceeded
7	I^2t	I^2t-limite exceeded

Minor errors

Code	Error	Explanation
2	Invalid motion task	An invalid motion task was started.
3	No reference point	When a motion task was started no reference had been set.
4	Reference not found	The reference point cannot be found.
8	SW limit switch 1	Software limit switch 1 exceeded
9	SW limit switch 2	Software limit switch 2 exceeded
10	Following error	The configured following error window exceeded

Causes and remedies

Error	Possible cause	Results	Acknowledgement
1 No encoder	– Encoder not connected – Encoder incorrectly connected – Encoder defective – Encoder cable defective	– Disablement – Error message	– Rectify error – Reset – Enable – Perform reference run – Start motion tasks
2 Invalid motion task	– Acc, dec or v of a started motion task is 0. – A relative motion task was started that would exceed the SW limit switch.	– Error message	– Enter motion task correctly – Clear error – Start motion tasks
3 No reference point	– The reference run was not performed prior to starting the first motion task. – Reference point was lost due to power failure. – Reference run was not correctly completed.	– Error message	– Clear error – Perform reference run – Start motion tasks
4 Reference not found	– Reference proximity switch is not connected. – Reference proximity switch is defective. – Reference proximity switch is not properly configured. – Cable of the reference	– Disablement – Error message	– Rectify error (see the mechanical operating instructions: Section “Zero point adjustment”) – Clear error – Enable – Perform reference run

	proximity switch is defective. – Encoder index cannot be found. (Incorrectly connected or defective encoder.)		
5 Peak current	– Load too great (due to the effects of force or torque, weight, jammed mechanism). – Collision with obstruction – Acceleration too high.	– Disablement – Error message	– Rectify error – Reset – Enable – Perform reference run – Start motion tasks
6 Nominal current	– Load too great (due to the effects of force or torque, weight, jammed mechanism).	– Emergency brake ramp – Disablement – Error message	– Rectify error – Reset – Enable – Perform reference run – Start motion tasks
8 Software limit switch 1	– Software limit switch 1 was undershot.	– Emergency brake ramp – Disablement – Error message	– Rectify error – Clear error – Enable – Start motion tasks
9 Software limit switch 2	– Software limit switch 2 was exceeded.	– Emergency brake ramp – Disablement – Error message	– Rectify error – Clear error – Enable – Start motion tasks
10 Following error	– Device overloaded, load too great (due to the effects of force or torque, weight, jammed mechanism) – Acceleration too high – Following error window was set too small.	– Emergency brake ramp – Disable – Error message	– Rectify error – Clear error – Enable – Start motion tasks

5.10.3 Parameters

Basic required settings for the selected device can be configured in the Parameters field. The Factory Settings button loads the basic settings defined by Montech.

Reference field

The reference run is an absolute motion task and serves to set the drive to zero for the following positioning task.
After the reference run the ECMR sets the InPos and Reference OK outputs.

Caution: The position controller cannot be operated without first having carried out a reference run.

The reference run can be defined with the following parameters. To be able to save the parameters on the ECMR, the controller must be in the disabled state.

v_sensor
Defines the speed for the reference proximity switch search.

v_index
Defines the speed for the encoder index search.

acc_ref
Defines the acceleration of the reference run.

Ref. offset
An absolute position value that differs from 0 can be assigned to the reference point. The reference position does not physically change; calculation with the offset as reference point is only within the position controller of the ECMR.

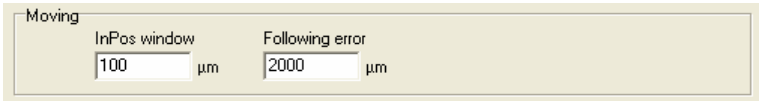
Software limit switches field

The software limit switches belong to the monitoring functions of the position controller. If one of the two software limit switches is exceeded or undershot, the drive is stopped with the emergency brake ramp and de-energized. The reference point is not lost.

Software limit switch 1
The actual position is monitored to ascertain whether it is less than the configured value. The software limit switch is defined as absolute position relative to the reference point.

Software limit switch 2
The actual position is monitored to ascertain whether it is greater than the configured value. The software limit switch is defined as absolute position relative to the reference point.

Moving field

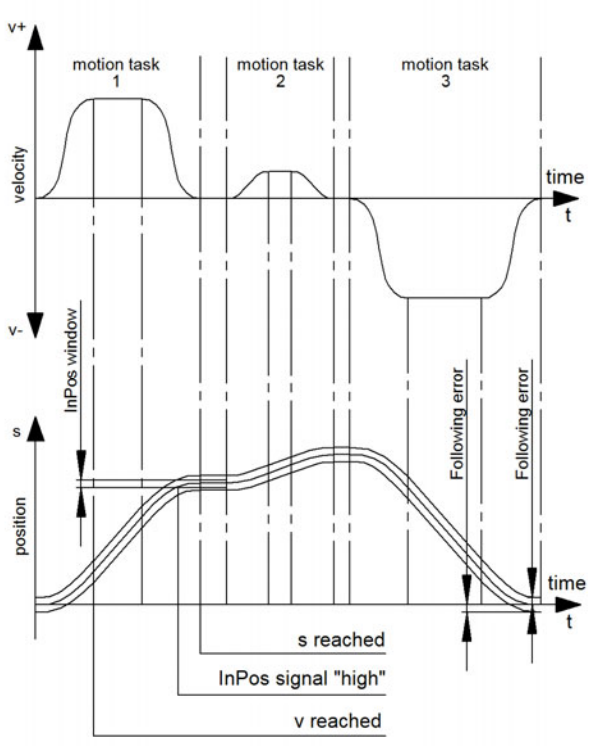


InPos window
This parameter defines the size of the In-Position window. The distance from the target position at which the message “InPos” is output can be defined. The drive travels precisely to the target position.

Possibly occurring effects:

Value is too low:	Positioning time increases
	No InPos message
Value is too high:	InPos is signaled too early

Following error
This parameter defines the maximum permitted deviation between the target and actual position values. If this deviation is exceeded, the ECMR generates an error message and brakes the drive with the emergency brake ramp. The motor is de-energized.



5.10.4 Status line

Disable	No reference	Current: 120mA	Actual position: 0 µm	No error	Operated for 13 hours

The status line is updated every 2 seconds.

Status	Indicates whether the final stage of the ECMR is enabled or not. Possible displays are “enable” or “disable”.
Reference	Indicates whether the reference point is set or not.
Current	Indicates the current that is presently flowing through the motor.
Position	Shows the actual position of the connected device.
Actual error	Indicates the current error. If there are no errors, “no error” is displayed.
Run time	Indicates the current status of the operation hours counter.

5.11 Teach-In

The Teach-In function copies the current actual position for a parameter.
This function is available for the programmable outputs for the "Position 1" and "Position 2" parameters ("I/0 configuration" window) and for the "s" parameter in the motion task table ("Motion tasks" window).

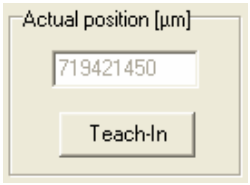
Caution: Before the Teach-In function can be used, a reference point must be set by means of a reference run.

Procedure:

- Put the device into the desired position
- The desired position of the device can be achieved in two ways:
  Jogging mode: The ECMR must be in the enabled state.
  Manual: The ECMR must be in the disabled state.

- Select the cell for which the current position value is to be copied.

- The "Teach-In" button then copies the actual position value into the active cell.



Caution: To be able to save the settings in the ECMR, the controller must be in the disabled state.

- Click OK.

5.12 Threshold values

Software limit switch 1	Device	Min. value		Max. value	
	KUSE-8-60	-1000	µm	59000	µm
	KUSE-8-120	-1000	µm	119000	µm
	KUSE-10-80	-1000	µm	79000	µm
	KUSE-10-160	-1000	µm	159000	µm
	DAE-60	-5000	°/1k	3595000	°/1k

Software limit switch 2	Device	Min. value		Max. value	
	KUSE-8-60	1000	µm	61000	µm
	KUSE-8-120	1000	µm	121000	µm
	KUSE-10-80	1000	µm	81000	µm
	KUSE-10-160	1000	µm	161000	µm
	DAE-60	5000	°/1k	3605000	°/1k

v_sensor	Device	Min. value		Max. value	
	KUSE-8-60	10	mm/s	40	mm/s
	KUSE-8-120	10	mm/s	40	mm/s
	KUSE-10-80	10	mm/s	40	mm/s
	KUSE-10-160	10	mm/s	40	mm/s
	DAE-60	5	°/s	50	°/s

v_index	Device	Min. value		Max. value	
	KUSE-8-60	10	mm/s	20	mm/s
	KUSE-8-120	10	mm/s	20	mm/s
	KUSE-10-80	10	mm/s	20	mm/s
	KUSE-10-160	10	mm/s	20	mm/s
	DAE-60	5	°/s	20	°/s

acc_ref	Device	Min. value		Max. value	
	KUSE-8-60	400	mm/s^2	2000	mm/s^2
	KUSE-8-120	400	mm/s^2	2000	mm/s^2
	KUSE-10-80	400	mm/s^2	2000	mm/s^2
	KUSE-10-160	400	mm/s^2	2000	mm/s^2
	DAE-60	500	$°/s^2$	1000	$°/s^2$

Ref. offset	Device	Min. value		Max. value	
	KUSE-8-60	-1000	µm	1000	µm
	KUSE-8-120	-1000	µm	1000	µm
	KUSE-10-80	-1000	µm	1000	µm
	KUSE-10-160	-1000	µm	1000	µm
	DAE-60	-5000	°/1k	5000	°/1k

InPos window	Device	Min. value		Max. value	
	KUSE-8-60	20	µm	2500	µm
	KUSE-8-120	20	µm	2500	µm
	KUSE-10-80	20	µm	3000	µm
	KUSE-10-160	20	µm	3000	µm
	DAE-60	20	°/1k	9000	°/1k

Following error	Device	Min. value		Max. value	
	KUSE-8-60	20	µm	2500	µm
	KUSE-8-120	20	µm	2500	µm
	KUSE-10-80	20	µm	3000	µm
	KUSE-10-160	20	µm	3000	µm
	DAE-60	20	°/1k	9000	°/1k

s	Device	Min. value		Max. value	
	KUSE-8-60	0	µm	60000	µm
	KUSE-8-120	0	µm	120000	µm
	KUSE-10-80	0	µm	80000	µm
	KUSE-10-160	0	µm	160000	µm
	DAE-60	0	°/1k	3600000	°/1k

v	Device	Min. value		Max. value	
	KUSE-8-60 hor.	0	mm/s	400	mm/s
	KUSE-8-60 vert.	0	mm/s	400	mm/s
	KUSE-8-120 hor.	0	mm/s	400	mm/s
	KUSE-8-120 vert.	0	mm/s	400	mm/s
	KUSE-10-80 hor.	0	mm/s	380	mm/s
	KUSE-10-80 vert.	0	mm/s	350	mm/s
	KUSE-10-160 hor.	0	mm/s	380	mm/s
	KUSE-10-160 vert.	0	mm/s	350	mm/s
	DAE-60 vert.	0	°/s	500	°/s
	DAE-60 hor.	0	°/s	300	°/s

acc = dec	Device	Min. value		Max. value	
	KUSE-8-60 hor.	0	mm/s^2	4500	mm/s^2
	KUSE-8-60 vert.	0	mm/s^2	4500	mm/s^2
	KUSE-8-120 hor.	0	mm/s^2	4500	mm/s^2
	KUSE-8-120 vert.	0	mm/s^2	4500	mm/s^2
	KUSE-10-80 hor.	0	mm/s^2	4000	mm/s^2
	KUSE-10-80 vert.	0	mm/s^2	3500	mm/s^2
	KUSE-10-160 hor.	0	mm/s^2	4000	mm/s^2
	KUSE-10-160 vert.	0	mm/s^2	3500	mm/s^2
	DAE-60 vert.	0	$°/s^2$	3000	$°/s^2$
	DAE-60 hor.	0	$°/s^2$	2500	$°/s^2$

6 Torque control

6.1 Overview

The desired torque “Current” and maximum travel speed can be defined by potentiometers. Further, it is possible to select from three stored torques and three maximum travel speeds via digital inputs.

Features
- Selectable direction
- 3 torques can be stored in the EEPROM
- 3 maximum travel speeds can be stored in the EEPROM
- Torque adjustable with potentiometers
- Maximum travel speed adjustable with potentiometers
- Output of hall sensor signals to digital outputs

Commissioning software functions
- Select connected device
- Set torque
- Set maximum speed
- Import/export configuration
- ECMR enable/disable toggle
- Select logic of the digital I/Os

6.2 Technical data

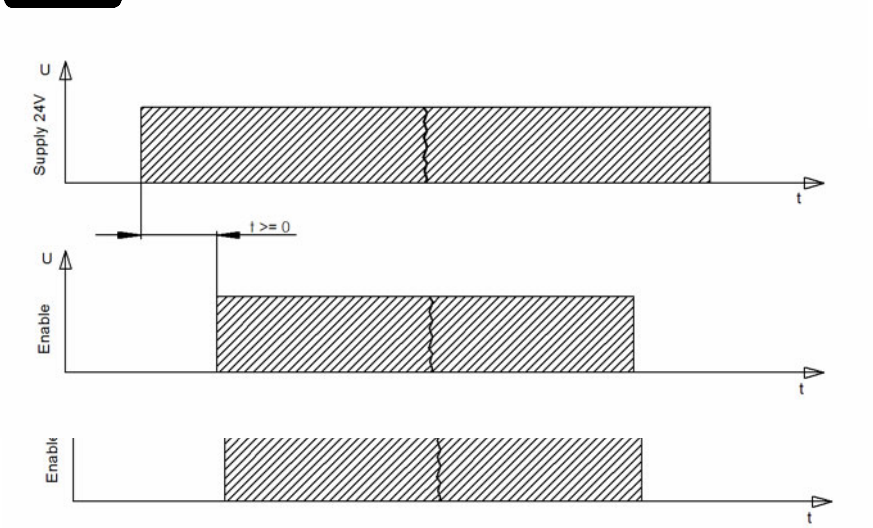
24 V voltage supply		1)	24 VDC (-9 + 20 %); 1.5 A Differences in voltage influence motor rpm
Current consumption (without motor current)			150 mA
Digital inputs			High: 22.8 VDC - 28.8 VDC Low: 0 VDC - 5.7 VDC transient protected
Number of digital inputs		2)	7
Digital outputs			Open source, 24 VDC, max. 1 A with 24 V, short circuit proof
Number of digital outputs		2)	4
Control input connections			2 mini Combicons, 7-pin
Signal output connections			2 mini Combicons, 5-pin
PC interface			RS-232 (9-pin male D-Sub)
Protection type			IP20
Weight		[kg]	0.6
Ambient:	Temperature	[°C]	10…50
	Rel. humidity	[%]	5%-85% (without condensation)
	Purity of the air		Normal workshop atmosphere
Installation type of the controller			Vertical (switch cabinet)
Dimensions (H x W x T) without plug			130 x 40 x 190 [mm]
Warranty period			2 years, commencing from the date of delivery

1) Minimum output currents: see Section 3.1
2) If the stored configuration is torque-controlled (Section 1.3.1 and 0.1)

6.3 On and Off switching behavior

The diagram below shows the functionally correct sequence when the ECMR is switched On and Off.

Caution:
Before enabling, ensure that the proper configuration is stored for the device!



If the enable signal is applied simultaneously with the 24 V voltage supply, the final stage of the ECMR is enabled only after the start-up routine is completed.

Caution:
Device travels to the end position!

6.4 Emergency-off function

The emergency-off function serves to bring the connected device to a standstill as quickly as possible in the event of danger.

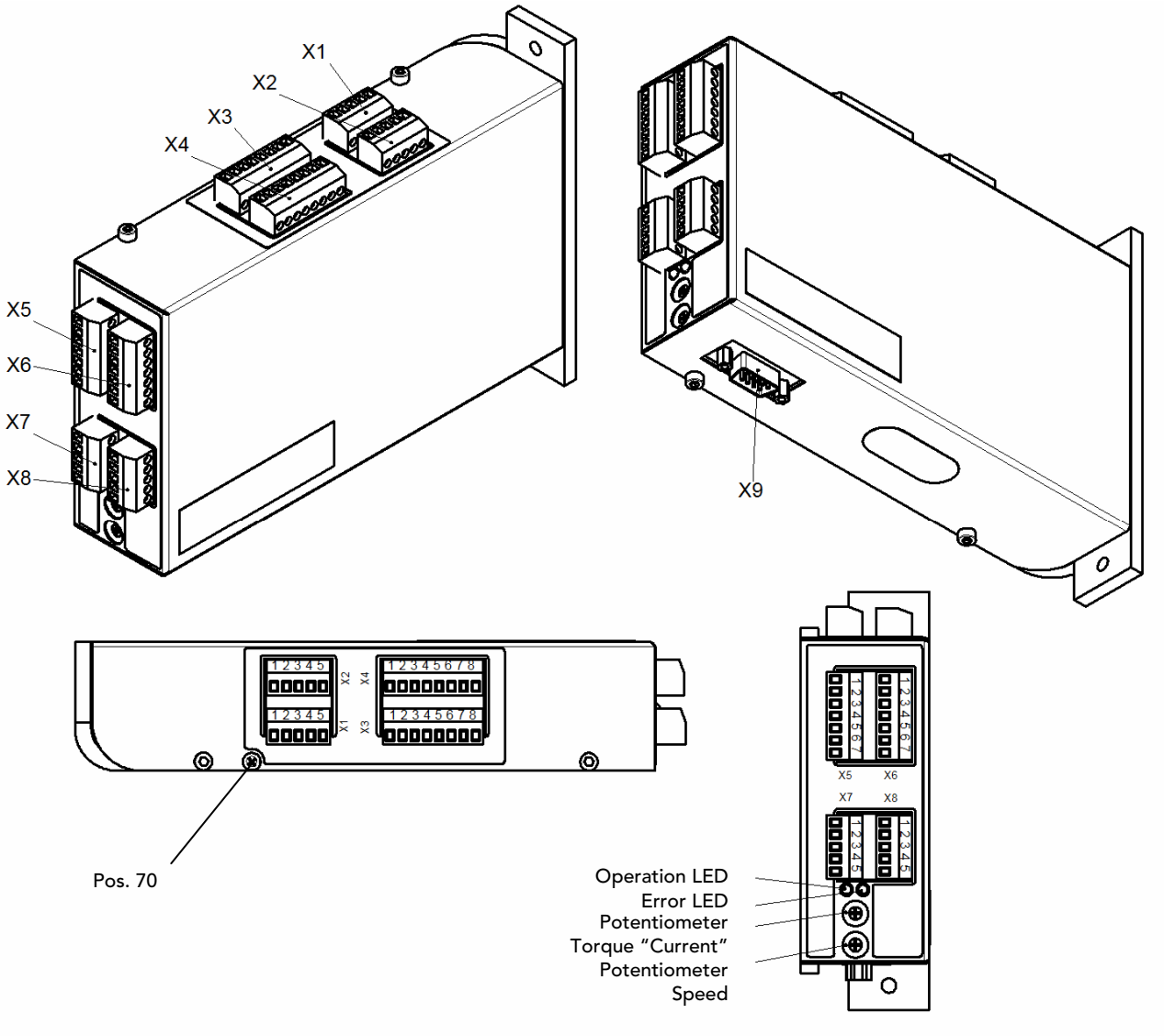
- The emergency-off function must be able to be initiated by a single person.
- The emergency-off function must always be ready for operation and available.
- The user should not have to think about how to use the device – it should be easy to use.

Implementing the emergency-off function:

- Removing the enable signal during the procedure results in switching off the motor current immediately. A result is that workpieces can no longer be solidly held.

6.5 Wiring

The wiring described in this section refers to the connector designations in the figure below.



- Only qualified specialist personnel are allowed to perform work such as installation, commissioning and maintenance.
- The ECMR must always be in a de-energized state (no voltage supplied) when wiring is performed.
- Never disconnect electrical connections when the voltage is on. In some cases electric arcs may occur which can injure persons and damage contacts.

6.5.1 Voltage supply

If the ECMR is deployed as a torque controller, only 24 V voltage supply is required.

The following devices can be operated with the ECMR as torque controller:

- GPE (electrical parallel gripper)
- GWE (electrical angular gripper)

Terminal	Designation	
X1-1	+ 24 V	Bridge on X1-2
X1-2	Motor windings	Bridge on X1-1
X1-3	+ 48 V	n.c.
X1-4	+ 48 V	n.c.
X1-5	GND	n.c.

Terminal	Designation	
X2-4	+ 24 V	+24 V power supply
X2-5	GND	GND power supply

n.c.: Not connected

6.5.2 Components

Motor

Controller		Connection cable component 10x0.25mm²
Terminal	Designation	Wire lead color
X2-1	Motor winding 1	White
X2-2	Motor winding 2	Brown
X2-3	Motor winding 3	Green
X3-1	U hall sensors	Red
X3-2	GND hall sensors	Blue
X3-3	Hall sensor 1	Yellow
X3-4	Hall sensor 2	Gray
X3-5	Hall sensor 3	Pink
-	-	Black
-	-	Violet

6.5.3 Digital inputs

Terminal	Designation
X5-1	Current bit 0
X5-2	Current bit 1
X5-3	Speed bit 0
X5-4	Speed bit 1
X5-5	n.c.
X5-6	Direction
X5-7	n.c.

Terminal	Designation
X6-1	Enable
X6-2	n.c.
X6-3	Reset
X6-4	n.c.
X6-5	n.c.
X6-6	n.c.
X6-7	n.c.

6.5.4 Digital outputs

Terminal	Designation
X7-1	Enable
X7-2	n.c.
X7-3	n.c.
X7-4	n.c.
X7-5	n.c.

Terminal	Designation
X8-1	Hall sensor 1
X8-2	Hall sensor 2
X8-3	Hall sensor 3
X8-4	n.c.
X8-5	n.c.

n.c.: Not connected

6.5.5 Communication

D-Sub connector	Designation
X9	RS-232

6.5.6 Conductor cross section

The following core cross sections are permitted for the digital inputs and outputs:

	Min. cross section [mm²]	Max. cross section [mm²]
Rigid	0.14	1.5
Flexible	0.14	1.5
Flexible with crimp connector without plastic sleeve	0.25	1.5
Flexible with crimp connector with plastic sleeve	0.25	0.5

6.6 Digital inputs/outputs

The digital inputs and outputs are operated by default in “active high” mode. The logic of the digital inputs and outputs can be changed to “active low” using the commissioning software. This means:

Active high

	Logical 1 (high or TRUE)	Logical 0 (low or FALSE)
Digital inputs	22.8 – 28.8 VDC	0 – 5.7 VDC
Digital outputs	> Voltage supply – 0.2V 24 – 0.2 = 23.8 VDC	-

Active Low

	Logical 1 (high or TRUE)	Logical 0 (low or FALSE)
Digital inputs	0 – 5.7 VDC	22.8 – 28.8 VDC
Digital outputs	-	> Voltage supply – 0.2V 24 – 0.2 = 23.8 VDC

6.6.1 Functions of the digital inputs

Current bit 0-1

These inputs are for selecting the saved currents for generating the motor torque. Three different bit coded torques can be selected with the two inputs.
If there is no signal on either input, the setting of the torque "Current" potentiometer is in effect. (Section 6.8)

Speed bit 0-1

These inputs are for selecting the saved maximum motor speeds. Three different bit coded speeds can be selected with the two inputs.
If there is no signal on either input, the setting of the speed potentiometer is in effect. (Section 6.8)

Direction

The rotation direction of the drive can be selected with this input.
high = gripper closed (if logic is "Active high")
low = gripper open (if logic is "Active high")

Enable

The enable input is for enabling the ECMR. A signal on this input enables the final stage. If no signal is present, the final stage is disabled.

– Device travels to the end position!

Reset

A signal on this input triggers a software reset of the ECMR. Current values in the working memory are deleted and the data stored in the EEPROM is loaded into working memory. The ECMR is in the normal state after a reset. A reset is possible only if the ECMR is in the disabled state.

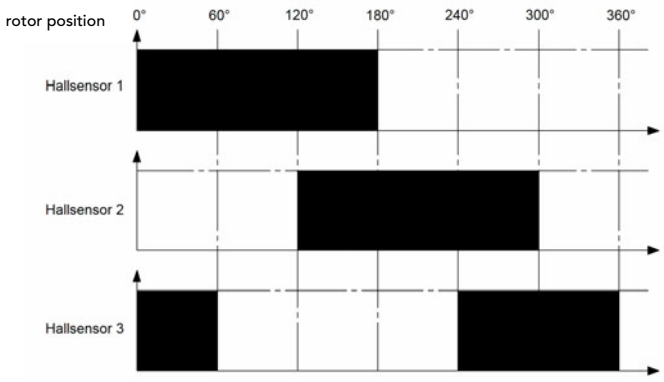
6.6.2 Functions of the digital outputs

Enable

Signal is output when the ECMR is enabled. The enable signal must be on the X6-1 terminal for enablement.

Hall sensors 1-3

The hall sensor signals can be tapped as 24 V signals on these three outputs.



6.7 Status display

The two LEDs (operation and error) indicate the status of the controller.

Green LED	The green LED is the operation LED. As soon as the ECMR is connected to a 24 V voltage supply, the LED becomes lit.
Red LED	The red LED is not used in the torque controller!

6.8 Potentiometers

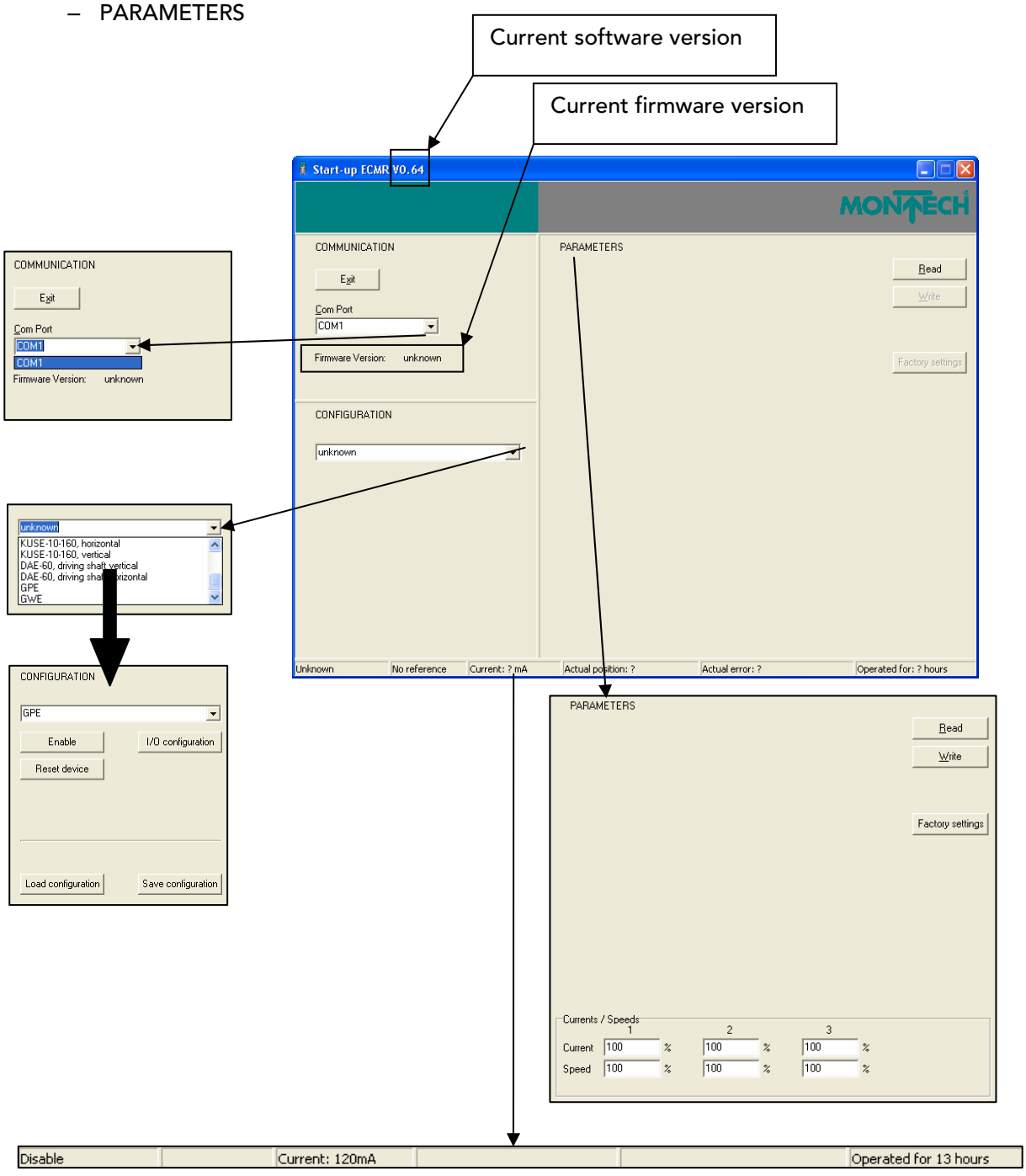
The torque "current" and speed potentiometers have an effect only for torque control (GPE, GWE). For position control (DAE, KUSE) the settings of these potentiometers are not taken into account.

Current	The current with which the motor torque is to be generated can be set with this potentiometer. The setting is found in the operating instructions of the relevant connected device.
Speed	The maximum motor rpm is set with this potentiometer. The setting is found in the operating instructions of the relevant connected device.

6.9 ECMR commissioning software

When the software is launched, the main window appears. It is divided into the following parts:

- COMMUNICATION
- CONFIGURATION
- PARAMETERS



6.9.1 Communication

In the Communication field you can configure the settings for the serial communication via the RS232 interface.
To enable communication with the ECMR, the COM port to which the ECMR is connected has to be selected in the drop-down menu.
Communication can be checked with the Read button. After the successful reading process, the current configuration of the ECMR and its firmware version are displayed.

The buttons that initiate communication are located in the top right corner of the "PARAMETERS" field.

Read	Reads the current configuration and stored parameters.
Write	Writes the selected configuration and parameters that have been set.

If the Read or Write button is actuated, the transmission progress is shown in a separate window. The transmission can be cancelled with the Stop button.

– Caution: Data can be sent to the ECMR only if it is in the disabled state.

6.9.2 Configuration

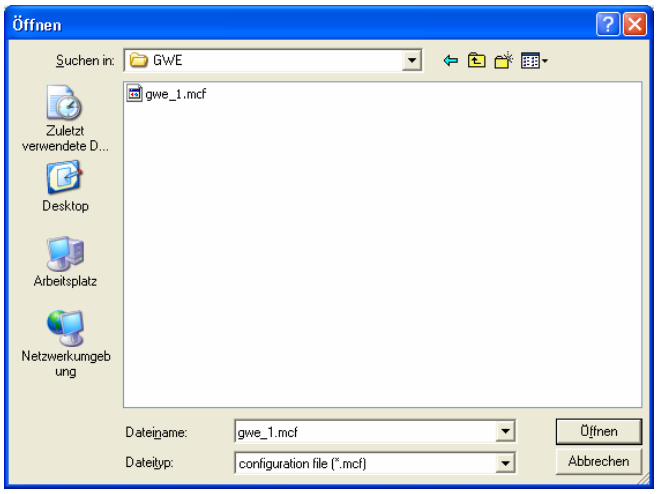
The data record for the device connected to the ECMR can be selected in the drop-down menu. The required parameters for the selected device are loaded in the parameters field.

Enable/Disable	If the ECMR is in the disabled state, this button (Enable) enables the ECMR. If the ECMR is in the enabled state, this button (Disable) disables the ECMR.
Reset device	This button triggers a software reset of the ECMR. Current values in the working memory are deleted and the data stored in the EEPROM is loaded into working memory. The ECMR is in the normal state after the reset. A reset can be performed only if the ECMR is in the disabled state.
I/O configuration	Opens the "I/O configuration" window. (Section 6.9.2.1)

Load configuration

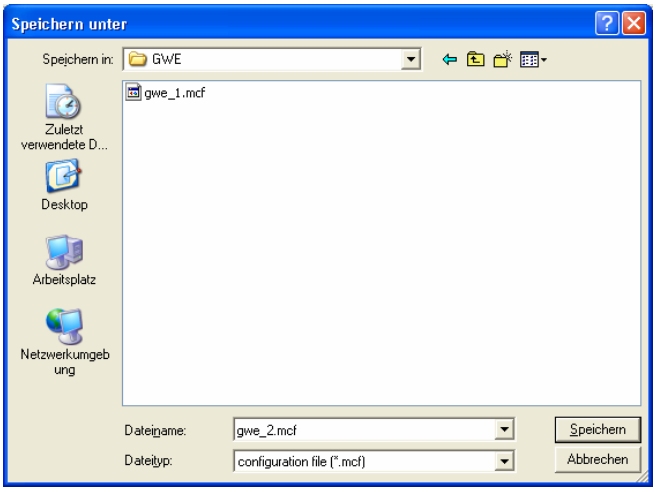
The Load configuration button loads the configurations stored in a Montech configuration file (.mcf). To load the Montech configuration file, the name of the file must match the currently configured device type (drop-down menu) of the ECMR.

Name of the mcf-files
GWE → Currently configured device type



Save configuration

This button saves the current configuration in a Montech configuration file (.mcf). The current device designation is added to the file name. It can be saved anywhere.



6.9.2.1 I/O configuration

The logic of the individual input and output signals can be defined in this window.

Active high:
0 V → Low
24 V → High

Active low:
0 V → High
24 V → Low

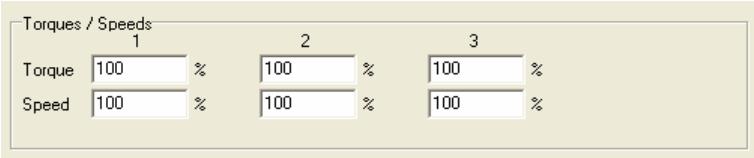
Cancel — The Cancel button voids the changed settings. The window is closed.

OK — The OK button saves the changed settings to the ECMR.

Caution: To be able to save the settings, the ECMR must be in the disabled state.

6.9.3 Parameters

The basic required settings for the selected device can be configured in the Parameters field. The Factory Settings button loads the basic settings defined by Montech.



Current (1, 2, 3) — Three currents can be configured with which the motor torque is generated. These are defined as a percentage of the maximum current. Using the digital inputs “Current bit 0” and “Current bit 1”, the settings are selectable via bit code. If no torque is selected (bit combination 0 0) via the digital inputs, the setting of the “Current” potentiometer is in effect.

Speed (1, 2, 3) — Three speeds can be configured which define the max. motor speed. These are defined as a percentage of the maximum speed. Using the digital inputs “Speed bit 0” and “Speed bit 1”, the settings are selectable via bit code. If no speed is selected (bit combination 0 0) via the digital inputs, the setting of the speed potentiometer is in effect.

6.10 Status line

The status line is updated every 2 seconds.

Status	Indicates whether the final stage of the ECMR is enabled or not. Possible displays are “enable” or “disable”.
Current	Indicates the current that is presently flowing through the motor.
Run time	Indicates the current status of the operation hours counter.

6.11 Threshold values

Current (1,2,3)	Device	Min. value		Max. value	
	GPE	2	%	100	%
	GWE	2	%	100	%

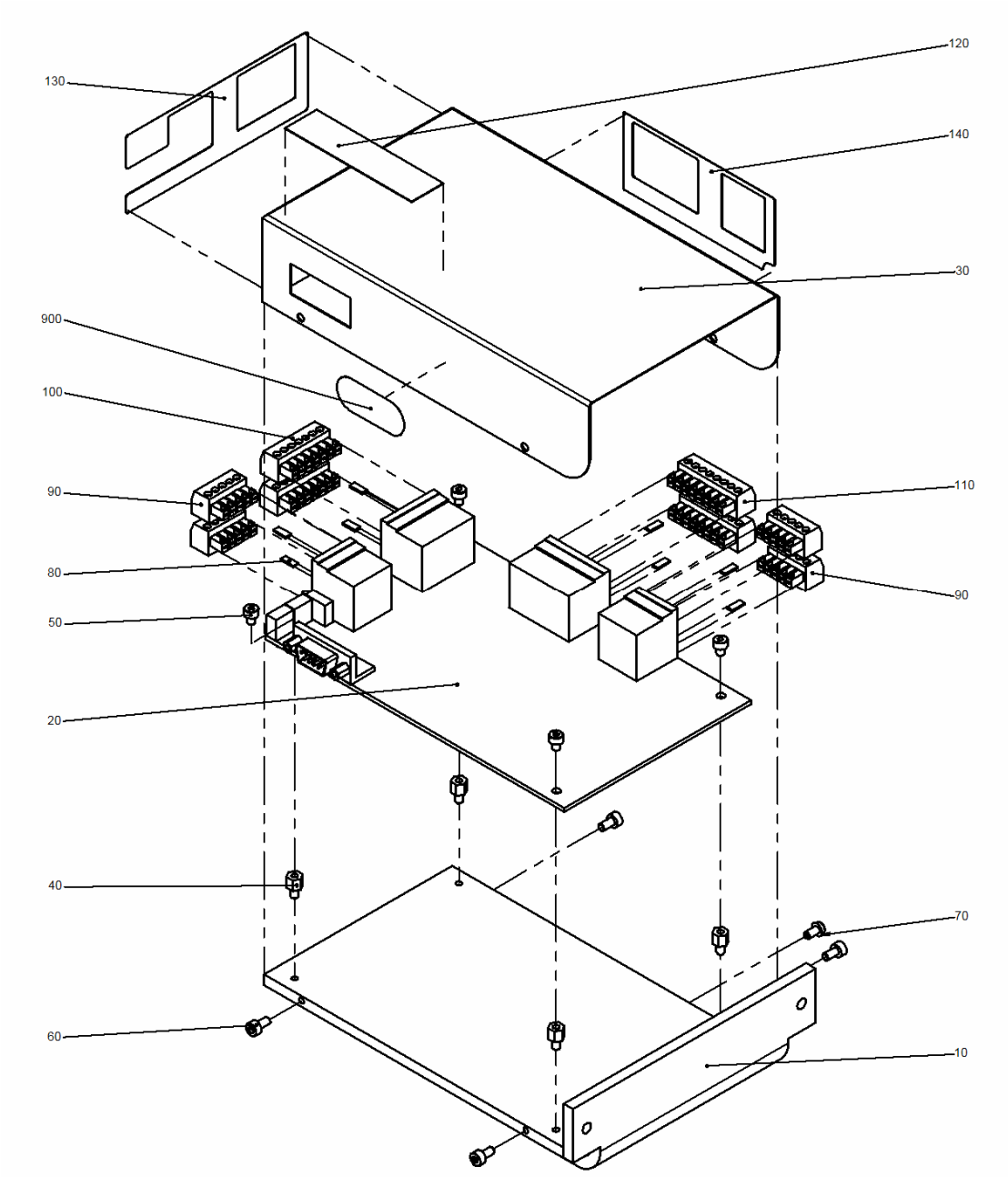
Speed (1,2,3)	Device	Min. value		Max. value	
	GPE	10	%	100	%
	GWE	10	%	100	%

7 Accessories

Connecting cable	Ref. No.
Serial cable PC-controller 3m	506157

8 Parts lists for ECMR

Exploded view



Pos.	Sym.	Designation	Ref. No.	Material
	◘	ECMR	57332	Various
10	◊	Base plate	57718	Aluminum
20	◊	Controller circuit board	57717	Various
30	◊	House cover	57720	Stainless steel
40	◊	Hex. M3x4 spacer	520203	Steel
50	◊	Cylinder screw I6kt M3x4	507545	Steel
60	◊	Cylinder screw I6kt M3x6	520043	Steel
70	◊	Thread grooved cylinder screw M3x6	520271	Steel
80	◊	Encoder profile	520394	Various
90	◊	5-pin connector	520395	PBT, various
100	◊	7-pin connector	520396	PBT, various
110	◊	8-pin connector	520397	PBT, various
120	◊	Montech logo	50536	Various
130	◊	Label sticker, front	58108	PVC
140	◊	Label sticker, top	58109	PVC
900	◊	CE type plate	41620	Polyester

- ● These are wearing parts and available ex stock
- ◊ Not available ex stock individually (upon request)
- ◘ Price list articles deliverable ex stock

9 General information

9.1 Environmental compatibility and disposal

Materials used:
- Aluminum
- Steel
- Polyvinyl chloride (PVC)
- Polybuteneterephthalate (PBT)
- Epoxy resin (EP)

Surface finishing:
- Anodized aluminum

Shaping processes:
- Aluminum and steel machining
- Aluminum and steel bending

Disposal:
No longer usable ECMRs should not be disposed of as complete systems but rather should be disassembled into parts and recycled by type of material. The type of material of each individual part is included in the replacement parts lists. Non-recyclable materials should be disposed of appropriately.

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